



Mr. James Saric
Remedial Project Manager
USEPA Region 5
77 West Jackson Boulevard (SR-6J)
Chicago, IL 60604-3590

Paul Bucholtz
Project Manager
MDEQ - Remediation Division
Constitution Hall
525 W. Allegan St., 3rd Floor
P.O. Box 30426
Lansing, MI 48909-7926

ARCADIS
10559 Citation Drive, Suite 100
Michigan 49116
Tel 810.228.8594
Fax 810.229.8837
www.arcadis-us.com

Subject:

Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site
Responses to Comments on the Area 1 Alternatives Screening Technical
Memorandum

Dear Messrs. Saric and Bucholtz:

On behalf of Georgia-Pacific LLC (Georgia-Pacific), please find attached responses to U.S. Environmental Protection Agency (USEPA) and Michigan Department of Environmental Quality (MDEQ) comments on the Area 1 Alternatives Screening Technical Memorandum (Area 1 ASTM) received on August 1, 2012 and August 10, 2012, respectively. Draft responses to USEPA comments were provided to USEPA on August 22, 2012 and reviewed and discussed with USEPA and MDEQ on August 29, 2012. Additionally, preliminary responses to a number of the MDEQ comments were submitted in a letter to MDEQ on September 6, 2012. These preliminary comment responses were discussed on a conference call between Georgia-Pacific, ARCADIS, USEPA, and MDEQ on September 12, 2012. It was communicated on that call that ARCADIS' intent was to submit responses to the comments following completion of the draft Area 1 Feasibility Study Report (Area 1 FS Report), which was submitted on October 30, 2012.

This letter transmits finalized responses to the USEPA and MDEQ comments, which are consistent with the revised Area 1 ASTM submitted as Appendix A to the Area 1 FS Report on October 30, 2012.

Sincerely,

ARCADIS

Michael J. Erickson, P.E.
Vice President

Date:
November 26, 2012

Contact:
Michael J. Erickson, P.E.

Phone:
810.225.1924

Email:
Michael.Erickson@arcadis-us.com

Our ref:
B0064539.0003.00645

Enclosure:

Responses to USEPA's comments on the Area 1 ASTM, received August 1, 2012
Responses to MDEQ's comments on the Area 1 ASTM, received August 10, 2012
Attachment 1 for MDEQ's RTC - Review of RAOs for Sediment Sites

Copies:

Garry Griffith, Georgia-Pacific LLC
Mark Brown, Waterviews LLC
Jeff Keiser, CH2M Hill
Heather VanDewalker, ARCADIS

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GENERAL COMMENTS

USEPA General Comment 1:

A discussion of the non-PCB constituents should be included in Section 3 including how the reduction of COC concentrations associated with PCBs will be documented.

Response

The Area 1 Feasibility Study Report (Area 1 FS Report) includes a discussion of non-PCB constituents (Section 1.2) and describes how the reduction of these constituents will be implemented through focus on PCBs.

USEPA General Comment 2:

Although not specific to the ASTM the Feasibility Study (FS) needs to discuss portions of other Operable Units (OUs) that may overlap with OU 5. The FS should address work that was either completed in other OUs that may impact OU 5, or work that was deferred from a particular OU and addressed in OU 5.

Response

Information about other OUs was included in Appendix E to the Area 1 Supplemental Remedial Investigation Report (Area 1 SRI Report). This appendix has been included in the Area 1 FS Report (Appendix B) so the reader does not have to refer back to the Area 1 SRI for information.

SPECIFIC COMMENTS

USEPA Specific Comment 1:

Section: ES Page: ES-4

RAO 1 – how will remedy success be defined? The detailed evaluation of alternatives in the FS related to this RAO needs to discuss the time frame in which fish tissue concentrations are expected to decline, and to what level.

Response

An assessment of the changes in PCB concentrations in fish tissue over time is provided in the detailed evaluation of alternatives within the Area 1 FS Report. A spreadsheet-based model has been utilized to estimate potential changes in fish tissue PCB concentrations over time resulting from implementation of each alternative. The methodology used to develop these projections is consistent with that described at the Area 1 FS planning meeting held July 23, 2012 in Romulus,

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Michigan and is presented in the Area 1 FS Report (Section 4 and Appendix E). The projections of fish PCB concentrations were then used to develop Area-1 specific estimates of future human health and ecological risk over time to evaluate RAOs 1 and 2. No changes related to this comment have been made in the Area 1 ASTM.

USEPA Specific Comment 2:

Section: ES Page: ES-4

The FS should explicitly describe how RAO 4 (reduce transport from Area 1 to downstream areas) will be addressed.

Response

An assessment of current water column levels and the expected reduction in transport of PCBs from Area 1 to downstream areas over time is included in the Area 1 FS Report (Section 4). No changes related to this comment have been made in the Area 1 ASTM.

USEPA Specific Comment 3:

Section: ES Page: ES-4

Remedial Approach for Sediments – Revise text to indicate that the long-term SWAC goal will be applied to Area 1 as a whole based on the assumption that fish spend an equal amount of time everywhere in the river channel in Area 1.

Response

The text in the Executive Summary has been revised to clarify that the long-term SWAC goal is applied to Area 1 as a whole based on the assumption that fish habitat is similar across Area 1 and fish exposure is integrated across Area 1 due to minimal barriers to fish migration.

USEPA Specific Comment 4:

Section: ES Page: ES-5

Text and Figure ES-1 - KPT 20 does not appear to be included in areas for hot spot removal and no justification is provided.

Response

Additional text has been included in the Executive Summary and in Section 5 of the Area 1 ASTM to indicate that the KPT 20 hotspot has not been retained for removal due to its small area and

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the volume of PCB-containing materials in that location (0.025 acres and 35 cubic yards, respectively, containing an estimated PCB mass of 0.57 kg).

USEPA Specific Comment 5:

Section: ES Page: ES-7

The sediment PRG is 0.33 mg/kg, and the post-TCRA SWAC in Portage Creek is estimated to be 1.8 mg/kg. An additional remedial alternative should be added for removal of sediments with PCBs > 1 mg/kg.

Response

SED-3 through SED-5 have been revised in the Area 1 ASTM (and Area 1 FS Report) to include the Portage Creek TCRA, and SED-6 has also been revised to refer to Area 1 sediments as a whole (i.e., including Portage Creek sediments with PCBs > 1 mg/kg). Similarly, completion of the Portage Creek TCRA has been added to the floodplain alternatives (FP-3 through FP-7). Therefore, those alternatives provided in Section 7.3 of the Area 1 ASTM specific to Portage Creek have been eliminated. Additionally, the floodplain alternatives have been renumbered so that the 0.5 mg/kg removal option is now represented by FP-7. This change has been reflected in all alternative names and descriptions.

USEPA Specific Comment 6:

Section: ES Page: ES-7

First paragraph under "Remedial Approach for Floodplain Soils – delete the phrase "While no further action may be merited for floodplain soils."

Response

The text has been deleted from the revised Area 1 ASTM, as requested. However, it is unclear why USEPA would request this valid statement to be removed.

USEPA Specific Comment 7:

Section: ES Page: ES-7

The first full paragraph in Remedial Approach for Floodplain Soils – The acronym RBC is not in the list of acronyms.

Response

Risk-based concentration (RBC) has been added to the acronym list as requested.

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USEPA Specific Comment 8:

Section: Figure ES-2 Page: ES-8

Figure ES-2 - It is unclear what is intended by the arrow between the two text boxes. Please clarify in the notes or delete the arrow. In addition, revise the definition of "red outline" in the legend to read "species type not documented at the Site but up to 17 species found at the Site are estimated to fall in this category."

Response

A footnote has been added to Figure ES-2 to clarify that the green arrow points out differences in results for robins between the CDM Site-Wide BERA and the Area 1 TBERA.

Although the categorization of avian receptors at the Site is incomplete, no high sensitivity vermivores have been identified among the large number of species observed at the Site in over 30 years of surveys conducted by the Kalamazoo River Nature Center. Moreover, the Audubon database for the state of Michigan (Michigan Audubon Records Committee 2012) was reviewed, and all of the birds with a predominantly vermivorous diet that have been observed in the state have been evaluated and found to be moderately sensitive. Thus, the category of high sensitivity vermivores is not applicable to the Site. This additional evaluation of the Michigan Audubon database was included and approved in the Area 1 SRI Report to clarify that high sensitivity vermivores are not expected at the Site. Therefore, the proposed revision to the red outline definition has not been made. See also the response to USEPA Specific Comment 13 for additional text that has been included in the 1st paragraph on p. ES-10 of the Area 1 ASTM Executive Summary to clarify this issue.

USEPA Specific Comment 9:

Section: Figure ES Page: ES-8

Insert the following text at the end of the last paragraph:

Proposed PRGs were selected from the range of RBCs presented in Figure ES-2 and attempted to balance uncertainty and protectiveness to assure that the PRGs are protective of all receptor groups and exposure pathways, while not being overly conservative given the uncertainty in the information.

Response

The text has been included as requested.

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USEPA Specific Comment 10:

Section: ES Page: ES-8

Last sentence "current conditions are protective across all the RBCs... except for RBCs based on the most conservative and highest uncertainty approaches." Delete the word "most" - Table ES-3 uses the geomean of the NOAEL and LOAEL, and comparison to the NOAEL would be the most conservative approach.

Response

The text in the Executive Summary of the Area 1 ASTM has been revised as follows:

"As this table demonstrates, current conditions (i.e., the residual soil PCB concentrations following completion of the TCRAs in Area 1) are protective across all the RBCs (i.e., greater than 85% of possible receptor home ranges have PCB concentrations below the relevant RBCs) except for RBCs based on the egg-based exposure approaches described in the Area 1 TBERA, which are highly conservative and include high uncertainty."

USEPA Specific Comment 11:

Section: Table ES-3 Page: ES-9

Change the footnote 2 that reads "No species of this category have been identified at the Site" to read as follows:

Species type currently not documented at the Site but up to 17 species found at the Site are estimated to fall in this category"

Response

See the response to USEPA Specific Comment 8 above and the final USEPA approved response to Specific Comments 1 through 4 on the Area 1 SRI Report. Although the categorization of avian receptors at the Site is incomplete, no high sensitivity vermivores have been identified among the large number of species observed at the Site in over 30 years of surveys conducted by the Kalamazoo River Nature Center. Moreover, the Audubon database for the state of Michigan (Michigan Audubon Records Committee 2012) was reviewed, and all of the birds with a predominantly vermivorous diet that have been observed in the state have been evaluated and found to be moderately sensitive. Thus, the category of high sensitivity vermivores is not applicable to the Site. This additional evaluation of the Michigan Audubon database was included and approved in the Area 1 SRI Report to clarify that high sensitivity vermivores are not expected at the Site. Footnote 2 has been revised as follows:

"No species of this category have been documented to be present at the Site or in the State of Michigan."

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USEPA Specific Comment 12:

Section: ES Page: ES-9

"The percent protectiveness at the LOAEL RBC is higher." Either delete this sentence or amend it to also indicate that percent protectiveness at the NOAEL RBC is lower.

Response

The sentence regarding the protectiveness at the LOAEL has been deleted.

USEPA Specific Comment 13:

Section: ES Page: ES-9 - ES-10

Delete the last sentence in the first paragraph on page ES-10 ("Thus, the proposed PRGs based on shrew are considered protective of avian species") and add the following text: "However, the categorization of avian receptors at the site is incomplete. Estimates are that between four and 17 high sensitivity species, some of which may be vermivorous, could be present on site. For high sensitivity insectivores (e.g., the grey catbird and European starling, represented by the house wren), the results were not in agreement – with one approach indicating no unacceptable risk and a second indicating likely risk."

Response

See the approved responses to USEPA Specific Comments 1 through 4 for the Area 1 SRI Report. The following text will be inserted to replace the last sentence in the 1st paragraph on p. ES-10 of the Area 1 ASTM Executive Summary:

"However, based on over 30 years of data from the Kalamazoo River Nature Center and on a search of the Michigan Audubon Society database (Michigan Audubon Records Committee, 2012) in combination with natural history information from the Birds of North America Online (published by Cornell Laboratory of Ornithology in association with the American Ornithologists Union - <http://bna.birds.cornell.edu>), no high-sensitivity species with a predominantly vermivorous diet (i.e. with greater than 40% worms) have been currently documented to be present within Area 1, the larger Site, or the State of Michigan.

Dietary RBCs for high and mid-range sensitivity insectivorous birds are higher than the proposed shrew-based PRGs. Thus, the proposed shrew-based PRGs are considered protective of avian species based on the dietary approach. For high sensitivity insectivores (e.g., the grey catbird and European starling, represented by the house wren), the dietary results were not in agreement

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with the more uncertain egg-based results – which would result in much lower RBCs as shown in Figure ES-2.”

USEPA Specific Comment 14:

Section: ES Page: ES-10

Delete line 9 and replace with the following text.

As discussed in the TBERA, there is uncertainty around estimating PCB concentrations in eggs from the site depending on alternative approaches to deriving bioaccumulation factors (BAFs). Egg-based RBCs for birds (12 and 25 mg/kg) based on those alternative BAFs are comparable to those of the shrew. Thus, RBCs of 11 and 18 mg/kg are considered protective of both birds and mammals at the Site.

Response

The text has been replaced as requested. Note that the new text refers specifically to Area 1, rather than “the Site.”

USEPA Specific Comment 15:

Section: ES Page: ES-10

The text states the no high-sensitivity vermivores are present within.... Change are present to “have been documented” within.

Response

The text has been amended as requested – see also responses to USEPA Specific Comments 8 and 13.

USEPA Specific Comment 16:

Section: 2.2 Page: 2-3

Second paragraph, last sentence – What is meant by “The participants also agreed that the Area1 TBERA would use the inputs to the CDM Site-Wide BERA as a point of departure.”?

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Response

The following text is from page 1-1 of the approved Risk Assessment Framework (ARCADIS 2008). *"This RA Framework was developed to establish the process for implementing Area-specific risk assessments. The existing USEPA-approved risk assessments performed by Camp Dresser & McKee (CDM) (CDM 2003a and 2003b) will serve as a point of departure for risk assessments in each Area. A risk assessment work plan will be prepared for each Area (as part of the SRI/FS work plans called for by the SOW1) that will establish what (if any) aspects of the CDM risk assessments will be revisited to prepare Area-specific risk assessments, and the basis for the proposed updates."*

On page 1-1 the Risk Assessment Framework also states, *"At a minimum, updated risk calculations are anticipated to be performed for each Area by incorporating more recent exposure data (e.g., new measurements of polychlorinated biphenyl (PCB) concentrations in soil, sediment, water, or fish). In conducting future Area-specific risk assessment work, the basis for changes from the CDM risk assessment methodology or inputs may also include the incorporation of new data, new science, new guidance, or new methodologies acceptable to USEPA that are current at the time each work plan is prepared."*

The following text is from page 1-4 of the approved Area 1 Baseline Ecological Risk Assessment Work Plan (ARCADIS 2010). *"As described in the RA Framework (ARCADIS 2008), the Area 1 BERA will use the inputs to CDM's Site-Wide BERA (CDM 2003a) as a point of departure."*

What is meant by "point of departure" is that if inputs to the Area 1 TBERA that have stronger scientific support were identified, these would be used instead of the existing inputs to the CDM Site-Wide BERA and outcomes of the Area 1 TBERA would then be used as the new area-specific risk assessment results. For those inputs where available information did not support a change, the Site-Wide BERA assumptions and input values were used. It was agreed upon with the Agencies to ensure that the inputs of the CDM Site-Wide BERA were considered and only revised when a more technically supported input was identified (ARCADIS 2008a. Risk Assessment Framework for the Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site. June 2008).

USEPA Specific Comment 17:**Section: 3 Page: 3-4**

Second paragraph and Table 3-3, KPT 20 is listed as a hotspot area but is not carried forward in the FS. Elimination of KPT 20 must be justified.

Response

As indicated in the response to USEPA Specific Comment 4, additional text has been added to the Area 1 ASTM as requested (see Executive Summary and Section 5.1.2).

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USEPA Specific Comment 18:

Section: 3 Page: 3-5

Delete the phrase "However, these concentrations are relatively low" and revise the rest of the sentence as follows: "Average and median surface sediment PCB concentrations were 2.2 mg/kg and 0.17 mg/kg, respectively."

Response

The text has been revised as requested.

USEPA Specific Comment 19:

Section: 3 Page: 3-8 and 3-9

Last bullet on page 3-8 – "Monitoring is continuing to evaluate the stability of the banks and the clean soil buffer zone. The Area 1 FS will incorporate results of the monitoring program in considering the permanence and effectiveness of the removal action." The evaluation of potential future channel migration in the former Plainwell Impoundment and Plainwell #2 Dam Area should qualitatively consider a longer time frame (e.g., 30 years) than the period of time currently addressed by the monitoring program (i.e., the FS report should acknowledge that the configuration of the river channel will change over time).

Response

The following paragraph is the first paragraph in Section 2.7 Stable Bank Design Concepts from the TCRA Design Report. *"The creation of a stable channel usually requires some degree of engineered bank protection, even when natural channel design procedures are applied. Hey (2006), in discussing streams similar to the Kalamazoo River based on Rosgen's (1996) classification, states that "to sustain the restoration design, some form of bank protection will normally be required, particularly if the natural floodplain alluvium has been regraded. This will need to maintain the dimension, pattern, and profile of the river either permanently or until the developing riparian vegetation is sufficiently resilient to prevent bank failure."*

The Design Report goes on to state: *"Although the USGS (Rheaume et al., 2002) has made reference to stable banks lined with cobble and boulders being present in the pre-impoundment channel, the horizontal limits of the project excavation are based primarily on the removal of PCB impacted sediment and soils. Unlike in the vertical direction, there is no intent to remove material horizontally to expose, or let erosion of the post-construction banks expose, this natural bank or allow the post-construction banks to erode to achieve this state."*

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The Area 1 FS Report includes a summary of the basis of design of the Plainwell Impoundment Removal Action and key information from the Design Report (ARCADIS BBL 2007). The project design anticipated some amount of erosion of the bank and adjustment of the channel in response to the removal action and provided for long term stability of the banks through a bank maintenance program. The design report specifically states that the river will not be allowed to erode the floodplain to create a wider channel because the banks will be maintained in a stable condition. Qualitative long term consideration of the banks and channel in the FS has been addressed as requested, with a core assumption that bank maintenance will continue under the agreement with MDEQ. The report includes qualitative assessment of the expected performance of the banks under a monitoring and maintenance program as requested, anticipating that the river will continue to change over time to some extent.

USEPA Specific Comment 20:

Section: 3 Page: 3-9

In line 10 of the second bullet, please revise as follows (additional text in italics): "This estimate is subject to considerable uncertainty, in particular with respect to the area *and depth* of floodplain soils impacted . . ."

Response

The bullet in Section 3 has been amended as requested.

USEPA Specific Comment 21:

Section: 3 Page: 3-12

"Low-level continuing sources of PCBs are present from the atmosphere, upstream areas, and the urbanized areas of the watershed, and in the future, these sources may ultimately limit the lowest achievable levels of PCBs in fish." Add any unremediated Area 1 sediments and floodplain soils to the list of low-level continuing sources of PCBs.

Response

The text in Section 3 has been revised to read "Low-level continuing sources of PCBs from the atmosphere, upstream areas, and urbanized areas of the watershed, and unremediated Area 1 sediments and floodplain soils may ultimately contribute to limitations on the lowest achievable levels of PCBs in fish."

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USEPA Specific Comment 22:

Section: 3 Page: 3-12

“ . . . further sampling in portions of Area 1 may be undertaken if necessary to further assess PCB hot spot assessment areas . . . ” Please describe under what circumstances any additional sampling would be performed – would this part of remedial design if these areas are included in the selected remedy? This comment also applies to the last paragraph on page 5-5.

Response

Text has been included in Sections 3 and 5 to indicate that further sampling may be undertaken “if determined to be necessary” in areas that are part of ongoing remedy selection and planning considerations.

USEPA Specific Comment 23:

Section: 3 Page: 3-12

Potential for Bank Sources of PCBs (page 3-12) and footnote 4 on page 3-13 – this discussion focuses on PCBs in bank soils between and above the former impoundments. The footnote on page 3-13 states that “ . . . river banks downstream of this point have been addressed as part of the two TCRAs . . . ” However, GP’s response to specific comment #10 on the Area 1 SRI indicated that “conclusions regarding channel stability have not yet been reached” and “the potential for future channel migration in the former Plainwell Impoundment and Plainwell #2 Dam Area will be assessed in the Area 1 Feasibility Study as needed to support the development and evaluation of remedial alternatives.” Please expand the discussion in this section to also qualitatively address future channel migration in the former impoundments given that the channel configuration will change over time. The FS should acknowledge that any PCB-containing floodplain soils left in place may act as an ongoing source of PCBs to the river, potentially controlling the degree to which fish tissue concentrations can recover. This comment should also be addressed on page ES-3 of the Executive Summary.

Response

As indicated in the Area 1 ASTM, the topic of future channel migration has been addressed in the Area 1 FS Report itself, rather than in the Area 1 ASTM. Refer to the response to Specific Comment #19 concerning bank and channel stability. The Area 1 ASTM includes an acknowledgement of the potential for un-remediated floodplain soils to contribute PCBs to the river along with other continuing low level sources, as indicated in the response to Specific Comment #21. As requested, the Area 1 FS report also includes this acknowledgement.

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USEPA Specific Comment 24:

Section: 3 Page: 3-12

Potential for Bank Sources of PCBs, first paragraph, last sentence – please revise as follows: “. . . and also contained elevated PCB soil concentrations. ~~although~~ The erosion rates, bank heights. . .”

Response

The text has been revised as requested.

USEPA Specific Comment 25:

Section: 3 Page: 3-12

Potential for Bank Sources of PCBs, second paragraph, third sentence – “Note that based on USEPA's requests, an alternative to address floodplain and bank soils in Area 1 . . . is included in the development of alternatives presented in Section 7.2. Add a reference to the specific alternative as follows: “. . . Section 7.2 (FP-3).”

Response

The alternative reference has been added as requested.

USEPA Specific Comment 26:

Section: 3 Page: 3-12

Potential for Bank Sources of PCBs, second paragraph, fourth sentence – revise as follows (new text shown in *italics*): “Continued inputs of PCB-containing soils from river banks *and floodplains* could potentially have some impact on the effectiveness of long-term achievement of the remedial goals for sediment *and fish*.”

Response

The text has been amended as requested to read:

“Continued inputs of PCB-containing soils from river banks and floodplains could potentially have some adverse impact on the effectiveness of long-term achievement of the remedial goals for sediment and fish.”

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USEPA Specific Comment 27:

Section: 3 Page: 3-13

The calculations performed to evaluate potential bank sources of PCBs are difficult to follow in narrative format. Please add a table of the input parameters used in the calculation, and the results for each step of the calculation. Please incorporate the bounding estimates provided in the last paragraph on page 3-14 into this table.

Response

Table 3-7 has been incorporated into Section 3 to indicate input parameters used in the calculation and the results for each step of the calculation. Bounding estimates of the annual PCB load from the remaining bank areas and volume of PCB-impacted soils have been incorporated in this table.

USEPA Specific Comment 28:

Section: 3 Page: 3-14

Please revise the first sentence of the last paragraph as follows (changes shown in italics and strikeout): "Given the relatively low erodibility of the banks outside of the former impoundments *compared to the banks within them*, this material may take many years (~~if ever~~) to erode into the river."

Response

The text has been amended as requested.

USEPA Specific Comment 29:

Section: 4 Page: 4-3

The first sentence in the first paragraph should state: " ... disposal of PCBs, including PCB remediation waste"

Response

The text has been amended as requested.

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USEPA Specific Comment 30:

Section: 4 Page: 4-3

Include in the first paragraph of the Sediment-Specific ARARs and TBCs section a reference to CWA 404.

Response

The text has been amended to include a reference to CWA 404 as requested.

USEPA Specific Comment 31:

Section: 4 Page: 4-3

Second paragraph of the Sediment-Specific ARARs and TBCs section should state: "The provisions of TSCA (40 CFR Part 761), specifically including 40 CFR 761.61, establish requirements for handling, storage, and disposal of PCBs and PCB remediation waste."

Response

The text has been amended to read:

"The provisions of TSCA, as regulated by 40 CFR Part 761 (specifically including 40 CFR 761.61), establish requirements for handling, storage, and disposal of PCB-containing materials and PCB remediation waste, with concentrations in excess of 50 mg/kg."

USEPA Specific Comment 32:

Section: 4 Page: 4-3

Second paragraph, second sentence in the Identification and Management of Hazardous materials ARARs/ Disposal and Storage ARARs section is missing a complete cite to the federal rules for transporting hazardous materials.

Response

It is assumed that the comment refers to text on page 4-7. As requested, the text in Section 4 has been amended per the paragraph provided below (new text provided in *italics*):

"Federal regulations for the transport and handling of hazardous materials are provided under 49 CFR Parts 107 and 171-172, *40 CFR* 263, and the elements of Part 111 of NREPA related to handling and transportation requirements. The rules under 49 CFR include procedures for

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packaging, labeling, manifesting, and transporting hazardous materials and would be potentially applicable to the transport of hazardous materials from Area 1 for remedial alternatives that include offsite disposal of excavated materials. *40 CFR 263 sets standards which apply to transporters of hazardous waste within the United States if the transportation will require a manifest under 40 CFR part 262.*"

USEPA Specific Comment 33:

Section: 4 Page: 4-4

In the Water-Specific ARARs, include a reference to TSCA, 40 CFR 761.50(a), which generally prohibits discharges of PCB containing water.

Response

The text in Section 4 has been amended per the paragraph provided below (new text provided in *italics*):

"The CWA and TSCA (as regulated under 40 CFR 761.50 (a)) establish effluent standards for contaminants such as PCBs in navigable waters of the United States, and regulates quality standards for surface waters. The ambient water quality criterion for navigable waters is 0.001 micrograms per liter (µg/L) total PCBs. *The provisions of TSCA (under 40 CFR 761.50 (a)) limit discharges with PCB concentrations exceeding 3 µg/L or outside the allowable discharge limit set in a permit to navigable waters.* These ARARs would be applicable to remedial alternatives that include discharge of water to the river."

USEPA Specific Comment 34:

Section: 4 Page: 4-5

In Wetland and Floodplain-Specific ARARs section reference CWA 404.

Response

The text has been amended with the sentence provided below:

"The provisions of CWA 404 would also require a permit for discharge of dredged material into navigable waters, including adjacent wetlands (see below)."

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USEPA Specific Comment 35:

Section: 4 Page: 4-7

In Navigable Waters, Lakes, Streams and Wetlands Specific ARARs, also reference CWA 301 and 404.

Response

The text has been amended per the paragraph provided below (new text provided in *italics*):

"Federal location-specific ARARs are contained in CWA 301, CWA 401, and CWA 404. CWA 301 and CWA 401 regulate any federally authorized activity that may result in any discharge into navigable waters and requires reasonable assurance that the action will comply with applicable water quality standards. The provisions of CWA 404 would require acquisition of a permit to discharge dredged materials into navigable waters. In addition, the Rivers and Harbors Act 33 CFR (regulated by 33 CFR Parts 320-330) prohibits unauthorized obstruction or any alteration of any navigable waters in the United States. If in-stream excavation or capping activities are performed, requirements for permits for affecting navigable waters of the United States will apply."

USEPA Specific Comment 36:

Section: 4 Page: 4-7

In Identification and Management of Hazardous materials ARARs/ Disposal and Storage ARARs section, include a reference to RCRA regulations 40 CFR parts 260-264, Michigan's NREPA part 111 (Hazardous Waste Management).

Response

Michigan's NREPA Part 111 is referenced in this section, but the text has been amended per the paragraph provided below (new text provided in *italics*).

"Regulations regarding identifying and listing hazardous wastes are pursuant to Resource Conservation and Recovery Act (RCRA) and outlined in 40 CFR Parts 260 to 264 and Part 115 (Solid Waste Management Regulations) of NREPA. 40 CFR Part 260 contains RCRA regulations governing identification, classification, generation, management and disposal of hazardous waste. 40 CFR Part 261 defines threshold levels and criteria to identify whether a material is hazardous waste. 40 CFR Parts 262 and 263 identify standards applicable to Generators and Transporters of hazardous waste, respectively. Operators of Hazardous Waste Treatment and Disposal facilities are governed by 40 CFR Part 264. Part 115 establishes rules for solid waste disposal facilities."

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USEPA Specific Comment 37:

Section: 4 Page: 4-10

RAO 1 – Revise the sentence in the first bullet as follows (change shown in italics): “This RAO is intended to protect human health by reducing the levels in fish taken by Kalamazoo River anglers *and/or* by otherwise reducing exposure of anglers and their families to PCBs.” In the FS, the discussion related to this RAO for each remedial alternative should discuss the time frame in which fish tissue concentrations are expected to decline, and to what level. How will remedy success be defined?

Response

RAO 1 has been amended per the text below.

“RAO 1: Protect humans who consume Kalamazoo River fish from exposure to PCBs that exceed protective levels. This RAO is intended to protect human health by reducing the PCB levels in fish taken by Kalamazoo River anglers *and/or* by otherwise reducing exposure of anglers and their families to PCBs.”

As indicated in the response to USEPA Specific Comment 1, an assessment of the changes in PCB concentrations in fish tissue over time is provided in the detailed evaluation of alternatives within the Area 1 FS Report. A spreadsheet-based model has been utilized to estimate potential changes in fish tissue PCB concentrations over time resulting from implementation of each alternative. The methodology used to develop these projections is consistent with that described at the Area 1 FS Planning meeting held July 23, 2012 in Romulus, Michigan and is presented in the Area 1 FS Report (Section 4 and Appendix E). The projections of fish PCB concentrations were then used to develop Area-1 specific estimates of future human health and ecological risk over time to evaluation RAOs 1 and 2. No changes related to this comment have been made in the Area 1 ASTM.

USEPA Specific Comment 38:

Section: 4 Page: 4-10

RAO 3 – Revise the sentence in the third bullet as follows (change shown in italics and ~~strikeout~~): “This RAO is intended to protect location populations of *birds and mammals* ~~ecological receptors~~ by reducing PCB concentrations . . .”

Response

The proposed change has been made.

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USEPA Specific Comment 39:

Section: 4 Page: 4-10

RAO 4 is never explicitly discussed in the ASTM (reduce transport from Area 1 to downstream areas). In the FS, text should be included that describes how this RAO will be achieved for each remedial alternative.

Response

As indicated in the response to USEPA Specific Comment 2, an assessment of current water column levels and the expected reduction in transport of PCBs from Area 1 to downstream areas over time is included in the Area 1 FS Report (Section 4). No changes related to this comment have been made in the Area 1 ASTM.

USEPA Specific Comment 40:

Section: 5.1 Page: 5-2

Section 5.1.2 (Hot Spot Areas), first paragraph – amend this paragraph to indicate that focused remediation of the hot spots would also address RAO 4 (reduce transport of PCBs from Area 1 to downstream areas and Lake Michigan).

Response

The text has been amended as requested.

USEPA Specific Comment 41:

Section: 5.1.2 Page: 5-3

What is the justification for elimination of KPT 20?

Response

See response to USEPA Specific Comment 4. Additional text has been included in the Executive Summary and in Section 5 of the Area 1 ASTM to indicate that the KPT 20 hot spot has not been retained for removal due to its small area and the volume of PCB-containing materials in that location (0.025 acres and 35 cubic yards, respectively, containing an estimated PCB mass of 0.57 kg).

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USEPA Specific Comment 42:

Section: 5 Page: Table 5-1 and 5-2

The first column on Tables 5-1 and 5-2 list subsections, these subsections need to be shown on Figure 5-11.

Response

Figure 5-11 has been revised to include subsections.

USEPA Specific Comment 43:

Section: 5 Page: 5-1 to 5-8

Incorporate the volume and SWAC evaluation for additional sediment RALs (0.25 ppm, 0.5 ppm, and 5 ppm) to support the selection of the 1.0 ppm RAL that is carried forward.

Response

Charts were provided for discussion during the July 23, 2012 Area 1 FS Planning meeting in Romulus, Michigan to review the volume/SWAC evaluation for the additional RALs. The volume and SWAC information contained on those charts as well as supporting discussion has been included as an additional section (Section 5.1.4) to the Area 1 ASTM to support selection of 1 mg/kg as a sediment RAL.

USEPA Specific Comment 44:

Section: 5.1.4 Page: Figure 5-11/Table 5-2

Provide a summary table that identifies the locations, maximum concentration, area and mass for each of the locations with concentrations >1.0 mg/kg.

Response

Table 5-2 has been revised to include additional information on location and maximum concentration.

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USEPA Specific Comment 45:

Section: 5 Page: 5-8

First paragraph, Line 9 – “For areas 1 through 5 . . . “Please change “areas” to “Sections” to be consistent with Table 5-2.

Response

The text has been amended as requested.

USEPA Specific Comment 46:

Section: 5.1.4 Page: Table 5-3

For the last three columns associated with Hypothetical Additional Hot Spots, change the symbol “-” to “currently unknown” or similar.

Response

The Table 5-3 has been amended as requested.

USEPA Specific Comment 47:

Section: 5.2 Page: 5-9

First paragraph – “. . . to identify whether or not a remedial action in the target areas would result in a significantly higher level of protection . . . “ Either define the term “significant” in this context, or delete it.

Response

The word “significantly” has been deleted from the first paragraph in Section 5.2.

USEPA Specific Comment 48:

Section: 5.2.1 Page: 5-12

Third paragraph – revise the following sentences as shown (changes shown in strikeout)
- “The NOAEL is a value below which no adverse effects have been observed and is included as a lower bound of potential effects, ~~but would not be considered a target goal for remedy implementation.~~ The LOAEL is a value at which adverse effects begin to occur in some species, ~~and depending on the underlying toxicity data and the spatial application of the PRGs, can be an appropriate basis for evaluating population-level effects.~~

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Response

The text in Section 5.2.1 has been amended as requested.

USEPA Specific Comment 49:

Section: 5.2.1 Page: 5-13

Change the text of last line of the second paragraph to read:

Table 5-6 summarizes the ranges of RBCs that will be considered as potential PRGs for the protection of wildlife. These ranges focus on the RBCs protective of receptor groups for which possible risk was identified in the Area 1 TBERA.

Response

The text has been amended as requested.

USEPA Specific Comment 50:

Section: 5.2.1 Page: 5-13

Insert the following text at the end of the second paragraph:

These RBCs represent a range of protectiveness and uncertainty. Proposed PRGs were selected from that range and attempted to balance uncertainty and protectiveness to assure that the PRG was protective of all receptor groups and exposure pathways, while not being overly conservative given the uncertainty in the information.

Response

The text has been added as requested.

USEPA Specific Comment 51:

Section: 5 Page: Figure 5-13

It is unclear what is intended by the arrow between the two text boxes. Please clarify in the notes or delete the arrow.

Change the note that reads "Red Outline – Species type not found at the Site" to read as follows:

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Species type currently not documented at the Site but up to 17 species found at the Site are estimated to fall in this category.

Response

See response to USEPA Specific Comment 8. A footnote has been added to Figure 5-15 to clarify that the green arrow points out differences in results for robins between the CDM Site-Wide BERA and the Area 1 TBERA.

Although the categorization of avian receptors at the Site is incomplete, no high sensitivity vermivores have been identified among the large number of species observed at the Site in over 30 years of surveys conducted by the Kalamazoo River Nature Center. Moreover, the Audubon database for the state of Michigan (Michigan Audubon Records Committee 2012) was reviewed, and all of the birds with a predominantly vermivorous diet that have been observed in the state have been evaluated and found to be moderately sensitive. Thus, the category of high sensitivity vermivores is not applicable to the Site. This additional evaluation of the Michigan Audubon database was included and approved in the Area 1 SRI Report to clarify that high sensitivity vermivores are not expected at the Site. Therefore, the proposed revision to the red outline definition has not been made. Additional text has also been included in the Executive Summary of the Area 1 ASTM to clarify this issue.

USEPA Specific Comment 52:

Section: Figure 5 Page: Figure 5-17

Please check the notes on this figure. There are notes for tPCBs and TEQ but they do not appear anywhere on the figure.

Response

It is assumed that the comment refers to Figure 5-18, A-45 and A-46. The notes related to tPCBs and TEQ have been deleted from these figures.

USEPA Specific Comment 53:

Section: Section 5 Figures

Because of the discussion in the text concerning the various RBC and approaches it is unclear in many of the figures what the EPC is expressed in. Please add the note that the EPC is for total PCBs to Figures 5-13, 5-17, 5-18, 5-19, and 5-24.

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Response

A note has been added to all figures referencing EPCs to indicate that the EPC is for total PCBs.

USEPA Specific Comment 54:

Section: Section 5.2.3 Page: 5-17

Delete the following sentence: "The LOAEL-based RBC may be the more appropriate decision making value as described in Section 5.2.1."

Response

The text has been deleted as requested.

USEPA Specific Comment 55:

Section: Section 5.2.3 Page: Table 5-9

In the legend, please revise the note in the legend as follows (changes shown in ~~strikeout~~ and *italics*): "No species of this category have been ~~identified~~ *documented* at the Site."
Also replace the word "identified" with "documented" in Notes 3 and 4.

Response

The legend and footnotes of Table 5-9 have been amended to replace the word "identified" with "documented", as requested.

USEPA Specific Comment 56:

Section: Section 5.2.3 Page: 5-19

Current Conditions – "In addition, both of these RBC values are based on the assumption that high sensitivity vermivores are present at the site, when in fact, none have been observed." Replace the word "observed" with "documented."

Response

The text has been amended to read (additional text in *italics*):

"In addition, both of these RBC values are based on the assumption that high sensitivity vermivores (*i.e., species with greater than 40% worms in diet*) are present at the site, when in fact, none have been observed *or documented*."

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USEPA Specific Comment 57:

Section: Section 5.2.3 Page: 5-22

Delete the second paragraph and replace with the following:

Based on the range of potential PRGs discussed in Section 5.2.1 and their relative confidence, in combination with the RAL analysis summarized below, values of 11 mg/kg PCB and 18 mg/kg PCB are proposed as the PRGs. The PRG of 11 mg/kg PCB is taken from the LOAEL-based RBC and 11 mg/kg PCBs is the geometric mean of the dietary NOAEL and LOAEL for the shrew. It is assumed that these PRGs also provide protection for high-sensitivity birds that may be present in the floodplain. The proposed PRGs are considered to be protective of all receptor groups and exposure pathways, while not being overly conservative given the uncertainty in the information.

Response

The text has been replaced as requested. In addition, the following text has been added to the end of the same paragraph:

"The proposed PRGs fall within the range of the RBCs for PCB-containing sediments identified in the Site-wide BERA and HHRA (CDM 2003a, 2003b), as shown on Figure 5-28."

USEPA Specific Comment 58:

Section 5.2.3 Page: 5-23

Replace the first two sentences of the third paragraph with the following:

The RAL of 20 mg/kg is also evaluated further for the 2-acre home ranges (insectivorous and vermivorous birds). This evaluation is conducted to demonstrate that the recommended RALs and PRGs would also be protective of local populations of avian receptors, which have larger home ranges.

Response

The text has been replaced as requested.

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USEPA Specific Comment 59:

Section 5.3 Page: 5-24

The post-TCRA SWAC for Portage Creek is 1.8 mg/kg, which is comparable to the SWACs in most of the hot spot areas evaluated in Section 5.1.2. Additional target areas for remediation should be identified using a 1 mg/kg RAL.

Response

As indicated in response to USEPA Specific Comment 5, SED-3 through SED-5 have been revised in the Area 1 ASTM (and Area 1 FS Report) to include the Portage Creek TCRA. SED-6 has also been revised to refer to Area 1 sediments as a whole (i.e., including Portage Creek sediments with PCBs > 1 mg/kg). Similarly, completion of the Portage Creek TCRA has been added to the floodplain alternatives (FP-3 through FP-7). Therefore, those alternatives provided in Section 7.3 of the Area 1 ASTM specific to Portage Creek have been eliminated. Additionally, the floodplain alternatives have been renumbered so that the 0.5 mg/kg removal option, is now represented by FP-7. This change has been reflected in all alternative names and descriptions.

USEPA Specific Comment 60:

Section 6.1 Page: Table 6-1

First row – Please delete the second sentence as shown - “No further remedial measures or monitoring conducted. ~~Would rely on ongoing natural attenuation of PCBs in sediments to further reduce exposures.~~” For no further action, no measures would be taken or relied upon to reduce risk over time.

Response

While the no further action alternatives would not include any active or passive remediation measures or monitoring (unlike the other alternatives), natural recovery processes will be ongoing and would be expected to further reduce risk over time. It is acknowledged that any resulting changes to PCB concentrations in soil, sediment, fish, or loading would not be tracked or evaluated. The text has been revised to state “natural recovery processes are anticipated to continue to occur over time.”

USEPA Specific Comment 61:

Section 7 Page: 7-2

The sediment alternatives are based on areas, identify the target SWAC goals in the bullet description for each alternative listed.

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Response

The ability of each alternative to achieve the long-term area wide SWAC goal of 0.33 mg/kg for sediments is identified in the Area 1 ASTM as a PRG for all sediment alternatives. It should be noted that for the majority of alternatives, this SWAC goal is expected to be achieved by a combination of active remediation and monitored natural recovery. There is a single Area-wide SWAC goal that is considered for all alternatives (rather than individual alternative-based SWAC PRGs). The degree to which each alternative achieves the 0.33 mg/kg PRG has been addressed in the detailed and comparative analyses in the Area 1 FS Report. The referenced bullet list is only intended to present a shortened summary description of each alternative and would not be appropriate to confound with additional detail.

USEPA Specific Comment 62:

Section 7 Page: 7-2

First paragraph under the bullets - For the sediment alternatives, the text states "it is assumed that all of the active sediment alternatives will include consideration of ongoing natural recovery processes and institutional controls until long term goals are achieved." MNR should be specifically listed as a component of alternatives SED-3A, 3B, 4A, 4B, 5A, and 5B. This is directly related to the comment regarding RAO 1 - how will remedy success be defined? This comment should also be addressed on page ES-6 of the Executive Summary.

Response

SED-1 through SED-6 have been revised in the Area 1 ASTM (and Area 1 FS Report) to include MNR. This change has been made to the alternative names and descriptions. As indicated in response to USEPA Specific Comment 1, an assessment of the changes in PCB concentrations in fish tissue over time is provided in the detailed evaluation of alternatives within the Area 1 FS Report. A spreadsheet-based model has been utilized to estimate potential changes in fish tissue PCB concentrations over time resulting from implementation of each alternative. The projections of fish PCB concentrations were then used to develop Area1-specific estimates of future human health and ecological risk over time to evaluate RAOs 1 and 2. The methodology used to develop these projections is consistent with that described at the Area 1 FS Planning meeting held July 23, 2012 in Romulus, Michigan, and is presented in the Area 1 FS Report (Section 4 and Appendix E). No changes related to this comment have been made in the Area 1 ASTM.

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USEPA Specific Comment 63:

Section 7 Page: 7-2

Second paragraph – revise the following sentence as shown (changes shown in italics) -
“Actual removal depths as well as required cap thickness and slope requirements will be established based on practical considerations and details concerning how *and over what time frame* cleanup goals would be achieved for individual remediation areas.”

Response

The established remedial alternatives consider a range of RALs (or cleanup goals). For each alternative, individual remediation areas are addressed (e.g., removal depths, cap thickness and slope requirements established) based on the RAL identified for that alternative. For each alternative, the time frame over which area-wide SWAC goals (or PRGs) are achieved (post-remedy construction) will likely vary for each alternative and are evaluated in the FS to determine the viability of each alternative. No changes related to this comment have been made in the Area 1 ASTM.

USEPA Specific Comment 64:

Section 7.1.1 Page: 7-4

The description of the no further action alternative states that “natural recovery processes would be relied upon to further reduce risk over time.” For the no further action alternative, no measures would be taken or relied upon to reduce risk over time.

Response

See response to USEPA Specific Comment 60. While the no further action alternatives (SED-1 and FP-1) would not include any active or passive remediation measures or monitoring (unlike the other alternatives), natural recovery processes will be ongoing and would be expected to further reduce risk over time. It is acknowledged that any resulting changes to PCB concentrations in soil, sediment, fish, or loading would not be tracked or evaluated. The text has been revised to state “natural recovery processes are anticipated to continue to occur over time.”

USEPA Specific Comment 65:

Section 7.3 Page: 7-18

Given that the post-TCRA SWAC in Portage Creek is estimated to be 1.8 mg/kg, additional remedial alternatives should be developed and evaluated in the FS using a 1 mg/kg RAL.

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Response

As indicated in responses to USEPA Specific Comments 5 and 59, SED-3 through SED-5 have been revised in the Area 1 ASTM (and Area 1 FS Report) to include the Portage Creek TCRA. SED-6 has also been revised to refer to Area 1 sediments as a whole (i.e., including Portage Creek sediments with PCBs > 1 mg/kg). Similarly, completion of the Portage Creek TCRA has been added to the floodplain alternatives (FP-3 through FP-7). Therefore, those alternatives provided in Section 7.3 of the Area 1 ASTM specific to Portage Creek have been eliminated. Additionally, the floodplain alternatives have been renumbered so that the 0.5 mg/kg removal option is now represented by FP-7. This change has been reflected in all alternative names and descriptions.

USEPA Specific Comment 66:

Section 7.3.1 Page: 7-19

Delete the following sentence - "Natural recovery processes would be relied upon to further reduce risk over time." For no further action, no measures would be taken or relied upon to reduce risk over time.

Response

As indicated in response to USEPA Specific Comment 64, while the no further action alternatives (SED-1 and FP-1) would not include any active or passive remediation measures or monitoring (unlike the other alternatives), natural recovery processes will be ongoing and would be expected to further reduce risk over time. It is acknowledged that any resulting changes to PCB concentrations in soil, sediment, fish, or loading would not be tracked or evaluated. The text has been revised to state "natural recovery processes are anticipated to continue to occur over time."

Editorial Comments:

Page 3-6, last line – insert a space between the right parenthesis and the word "adjacent"

Page 5-1, first bullet – change "media" to "medium"

Page 6-6, Section 6.4.2, first sentence – change "land use restrictions was" to "land use restrictions were"

Response

Editorial revisions have been made on pages 3-6, 5-1, and 6-6 as requested.

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**RESPONSES TO MDEQ'S COMMENTS ON THE AREA 1 ALTERNATIVES SCREENING
TECHNICAL MEMORANDUM, RECEIVED AUGUST 10, 2012**

MDEQ Key General Comment 1:

The ASTM needs to revise the remedial action objectives (RAOs) for human and ecological health to be consistent with feasibility study (FS) guidance under superfund, and those previously applied for the Fox River FS and Record of Decisions (RODs), which require that a selected remedy have risk-based targets that will be protective of human and ecological receptors^{1,2}. As currently written, the ASTM has not developed risk-based RAOs. The revised RAOs for human and aquatic receptors are taken directly from the United States Environmental Protection Agency (USEPA)/Wisconsin Department of Natural Resources (WDNR) approved Fox River FS and RODS [2002, 2003, 2007 (see Enclosure)], where Georgia-Pacific is a responsible party as they are for the Kalamazoo River. The following are the RAOs proposed by Georgia-Pacific followed by recommended, revised language.

ASTM RAO 1: Protect humans who consume Kalamazoo River fish from exposure to polychlorinated biphenyls (PCBs). This RAO is intended to protect human health by reducing the levels in fish taken by Kalamazoo River anglers or by otherwise reducing exposure of anglers and their families to PCBs.

Revised RAO 1: Protect humans who consume fish from exposure to chemicals of concern (COCs), in particular PCBs that exceed protective levels. This RAO is intended to protect human health by reducing the COCs levels, in particular PCBs, in fish taken by Kalamazoo River anglers and their families to acceptable risk levels. In addition, the RAO is intended to reduce or eliminate PCB based fish consumption advisories as quickly as practicable.

ASTM RAO 2: Protect aquatic ecological receptors from exposure to concentrations of PCBs in sediments that exceed protective levels for local populations. This RAO is designed particularly to protect fish-eating birds and mammals, by reducing fish tissue PCB concentrations to levels that do not harm the sustainability of local populations of these receptors.

Revised RAO 2: Protect aquatic ecological receptors from exposure to COCs, in particular PCBs, above protective levels. This RAO is designed particularly to protect fish-eating birds and mammals, by reducing fish tissue PCB concentrations to acceptable risk levels.

¹ <http://dnr.wi.gov/org/water/wm/foxriver/documents/fs/FinalFSSection4.pdf>

² <http://www.foxrivercleanup.com/resources/amendedrod.pdf>

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Response

In response, RAO 1 has been revised as follows:

Protect humans who consume Kalamazoo River fish from exposure to polychlorinated biphenyls (PCBs) that exceed protective levels. This RAO is intended to protect human health by reducing the *PCB* levels in fish taken by Kalamazoo River anglers *and/or* by otherwise reducing exposure of anglers and their families to PCBs.

No revision is proposed for RAO 2.

The RAOs were selected consistent with Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) guidance and Agency approved site-specific documents. As outlined in Section 4.2 of the Area 1 ASTM, and in accordance with USEPA's RI/FS guidance (October 1988), the RAOs were identified to protect human health and the environment based on available information and standards, such as the preliminary Applicable or Relevant and Appropriate Requirements (ARARs), "to be considered" (TBC) guidelines, and risk based concentrations (RBCs) established using the findings from the human health and ecological risk assessments. The RAOs for Area 1 were selected to be protective of those receptors and associated exposure pathways where the site-specific risk assessments concluded risk was present or likely.

Attachment 1 provides a list of RAOs for other sites that were reviewed in preparation of the RAOs. There are many precedents consistent with the approach taken. A site-specific process led to the specific wording of RAOs and remedy development approach for the Fox River site (WDNR 2002), which is not a Federal Superfund Site. A site-specific approach is also appropriate for Area 1 without being tied to only specific elements of one prior precedent project. Furthermore, the MDEQ's representations of the Fox River project are not consistent with our review of the record for that site.

PCBs are the COCs for Area 1 as established in the approved *Area 1 Supplemental Remedial Investigation Report* (Area 1 SRI Report; ARCADIS 2012) and Risk Assessment Framework (ARCADIS 2008), are the only COCs evaluated in the USEPA-approved Site Wide Human Health Risk Assessment (HHRA), and have also been the focus of the remedial investigation and feasibility study work conducted over nearly 20 years. RAOs were therefore developed to focus on PCBs as the COC. A discussion of non-PCB constituents has been included in the Area 1 Feasibility Study Report (Area 1 FS Report; see Section 1.2).

No explanation is provided for the qualifiers (e.g., "reduce or eliminate PCB based fish consumption advisories as quickly as practicable") used in the requested RAO rewrites. Time is

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only one of the considerations in evaluating the effectiveness and performance of an alternative. For example, the RAOs could also bring in other evaluation criteria associated with least impact to habitat during construction, lowest cost, etc. There are many precedents for RAOs on other sites that do not include a time element in formulation of the RAO language. Note that consideration of the estimated time to achieve risk targets has been discussed under the short-term effectiveness evaluation criterion in the Area 1 FS Report per USEPA's RI/FS guidance (October 1988) which incorporates "an estimate of time required to achieve protection for either the entire site or individual elements associated with site specific areas or threats."

MDEQ Key General Comment 2:

The ASTM needs to develop an array of remedial action limits (RALs) that are compared to risk-based preliminary remedial goals (PRGs)/sediment quality thresholds (SQTs), as outlined in Figure 5-1 in order to generate costs and benefits for alternative remedial actions as conducted for the Fox and other rivers³. While the ASTM developed a wide range of RALs for floodplain soils and compared these to PRGs/risk-based concentrations (RBCs) and remedial volumes, a similar approach was not conducted for in-stream sediments. Only two RALs of 1 and 50 parts per million (ppm) were evaluated, and not compared to PRGs/SQTs which does not permit an effective FS evaluation of alternatives. In addition, the ASTM did not evaluate cleanup scenarios necessary to achieve many of the sediment RBCs presented in Figure 5-1 and, as a result, does not present a sufficient range of remedial alternatives for evaluation in the FS. The ASTM did not evaluate how the proposed RALs of 1 and 50 ppm (hot spots) would meet risk-based SQTs/RBCs or the degree to which fish consumption advisories would be reduced or eliminated.

The Fox River FS fully developed sediment RALs of 0.125, 0.250, 0.50, 1.0, 5.0 and 10 ppm and compared these RALs to: (1) resultant human health and ecological risk based SQTs/PRGs and estimated surface weighted average concentrations (SWACs) following remedial action, (2) the time needed to achieve acceptable risks and elimination of fish consumption (e.g., walleye) advisories after a longer recovery period, and (3) the costs. For human health, acceptable risks SQTs of 0.014 to 0.058 ppm were derived and compared to RALs. A sediment RAL of 1.0 ppm was ultimately selected for the remedy. Future projections described in the Fox River FS indicated that risk-based SQTs for recreational anglers would be met in 10 years, SQTs for high-intake fish consumers would be met in 30 years, and SQTs for wildlife would be met in 30 years.

Figure 5-1 provides a range of risk-based PRGs, with cancer targets of 10⁻⁴, 10⁻⁵, and non-cancer Hazard Quotients (HQs) = 1 and these should be fully discussed in the

³ <http://dnr.wi.gov/org/water/wm/foxriver/documents/whitepapers/RS%20White%20Paper%20No%2011.pdf>

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ASTM. The PRG of 0.33 ppm is not risk based. PRGs based on background estimated from the Ceresco Reservoir reference site should also be presented. How PRGs are met immediately following construction and following a longer term recovery period should be considered during the development of remedial action alternatives.

It should be recognized that for PCB contaminated sediments, non-cancer risks are often the driver since achieving an HQ = 1 is a more protective goal than achieving a 10⁻⁵ risk level for some receptors. Sediment-based PRGs with an HQ = 1 include bass/carp subsistence- 0.07 milligrams per kilogram (mg/kg), bass only subsistence-0.12 mg/kg, and bass- high end sport angler - 0.34 mg/kg. SWAGs should be developed over an appropriate spatial scale (not all of Area 1) that takes into account fishing patterns and species home range.

It is worth noting that the analysis presented in Table 5-2 for the RAL of 1 ppm results in a SWAC of 0.17 mg/kg- comparable to that predicted for the Fox River immediately following remediation. However, because of the way Table 5-2 is portrayed, it is presented as an extreme amount of remediation, since only two RALs, 1 and 50 ppm were evaluated.

To make the ASTM and FS a useful document for risk management decision making, an array of RALs consistent with the FS for the Fox River would evaluate RALs of 0.125, 0.25, 0.50, 1.0, 5.0 and 10 ppm and the relationship to risk-based PRGs/SQTs and effect on PCB fish consumption (e.g., smallmouth bass) advisories. It is inappropriate that the ASTM identifies hot spots greater than 50 ppm, a concentration which does not have any basis in risk and represents the regulatory threshold for PCBs under the Toxic Substances Control Act (TSCA). No FS produced in Region 5 in the past decade has ever used a 50 ppm RAL. The last major site in Region 5 to use a 50 ppm RAL for PCBs was the Waukegan Harbor Site. This resulted in the failure of the cleanup with respect to remaining high risks to fish consumers. The United States Environmental Protection Agency (USEPA) has adopted a RAL of 1 ppm in their recent 2009 ROD to address this issue. Therefore, the MDEQ recommends that the 50 ppm value should be eliminated from consideration as a RAL in the FS. Note that for this site, the USEPA is using a removal value of 10 ppm with a goal of 1 ppm for the Portage Creek Time Critical Removal Action.

Response to Paragraphs 1 and 2

Charts were provided for discussion during the July 23, 2012 Area 1 FS Planning meeting in Romulus, MI that presented the volume/SWAC/mass relationships to a range of possible RAL values. The information contained on those charts as well as supporting discussion has been included as an additional section (Section 5.1.4) to the Area 1 ASTM to indicate how 1 mg/kg and

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50 mg/kg compare with other potential RALs, and to support the selection of the RALs. These graphs illustrate the “knee-of-curve” basis that is supportive of the RAL of 1 mg/kg. The selection of 50 mg/kg is not risk based because the consideration of hot spot remediation is also not hinged on achievement of a particular SWAC. The surface sediment concentrations in the hot spots are already quite low with two exceptions, and due to the small size of the hot spots, remediation of these areas has little effect on the Area 1-wide SWAC. The basis for use of 50 mg/kg flows from the hot spot assessment program (ARCADIS 2009, approved by USEPA on August 17, 2009), which identified that “Locations with a maximum total PCB concentration greater than or equal to a threshold of 50 milligrams per kilogram (mg/kg) were considered for the hot spot assessment.....Six areas targeting eight sample locations with PCB concentrations greater than 50 mg/kg (two of the six areas include two samples each) were selected for further assessment.... In each case, the assessment areas are located along one or the other bank of the river and do not extend across the entire channel, being bound in the off-shore extent by adjoining low PCB concentrations and/or presence of coarse sediment.” A further basis for constructing hot spot remediation alternatives is to address a PCB inventory concentrated in these relatively small deposits that could potentially be remobilized.

No additional RALs are proposed for evaluation in the Area 1 FS Report; the Area 1 ASTM describes the basis for the RALs selected and the relationships between RAL and the mass of PCBs, the volume of sediment, and the surface area of sediment. Evaluation of resulting sediment SWACs and potential changes in fish over time has been included in the Area 1 FS Report, as discussed during our July 23, 2012 meeting.

Response to Paragraph 3

The RBCs developed by CDM were presented in comparison to the MDEQ detection limit of 0.33 mg/kg in the CDM HHRA (CDM 2003b). Based on this comparison, 0.33 mg/kg falls within the range of the RBCs for PCB-containing sediments identified in the Site-wide Baseline Ecological Risk Assessment (BERA) and HHRA. The value 0.33 mg/kg itself is not an RBC and the Area 1 ASTM revisions make that clear, but support its selection as a long term SWAC goal based on how it falls within the range of RBCs.

While ARCADIS agrees that the Ceresco Reservoir may be an appropriate reference site, we believe that Morrow Lake is also an appropriate reference water body for developing PRGs for Area 1. Morrow Dam has not been affected by paper-making sources of PCBs that impacted Area 1; however, fish consumption advisories are in place for Morrow Lake due to other sources of PCBs. Morrow Lake continues to be a source of PCBs to the Site. There is no plan or process in place to remediate PCBs in the lake. It has to be assumed that the lake will continue to serve as a source of PCBs to the Superfund Site.

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An assessment of the changes in PCB concentrations in fish tissue over time has been provided in the detailed evaluation of alternatives within the Area 1 FS Report (Section 4 and Appendix E). A spreadsheet-based model has been utilized to estimate potential changes in fish tissue PCB concentrations over time resulting from implementation of each alternative. The methodology used to develop these projections was described at the Area 1 FS planning meeting held July 23, 2012 in Romulus, MI and has been presented in the Area 1 FS Report. The projections of fish PCB concentrations were then used to develop Area-1 specific estimates of future human health and ecological risk over time.

Response to Paragraph 4

The Area 1 SRI Report presented both the Area 1-wide Kalamazoo River SWAC and the SWAC for subsections of the river in Area 1. Due to differences in physical characteristics and habitat between the main river channel and Portage Creek, the SWAC for Portage Creek is evaluated separately from the river SWAC. The Area 1 ASTM and Area 1 FS continue to evaluate the Area 1-wide SWAC as previously, but identify post-remedy SWACs associated with the same river sections identified in Table 3-1 of the Area 1 ASTM.

Response to Paragraphs 5 and 6

The Area 1 ASTM content and methods were developed through multiple discussions with the USEPA Region 5 Project Manager and MDEQ to provide the information that decision makers would need for risk management.

The Hot Spot Assessment program (ARCADIS 2009), which was approved by USEPA in August 2009, adopted 50 mg/kg as a basis to identify those areas that would be subject to focused sampling to identify whether hot spots were present. During this assessment, areas of disproportionate PCB mass per unit volume were identified. A number of the locations containing 50 mg/kg or higher PCB concentrations were shown not to represent hot spots due either to elevated concentrations no longer being present upon re-sampling, the presence of sediment deposits that were very small in size, and/or a limited thickness and area of sediment such that the PCB mass in the location was very small.

The alternatives developed for remediation of hot spots were not founded on the basis of reducing current SWACs as current SWACs are already low. The Area 1-wide SWAC is 0.53 mg/kg, excluding Portage Creek, and 0.55 mg/kg, including Portage Creek, which is already less than a factor of two different from the long-term SWAC goal of 0.33 mg/kg. Moreover, upstream of the Plainwell No. 2 Dam Area, the SWAC is 0.38 mg/kg. The inclusion of the hot spot-focused alternatives is based on a consideration of the potential PCB mass inventory that could serve to sustain higher exposure levels if eroded or remobilized in the future and transported downstream. Implementation of the hot spot alternatives would reduce future potential opportunities for

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exposure of these sediments at depth, and would also provide management of inventory. RALs typically consider exposure concentrations (i.e., surface only); whereas in this case, the entire sediment column is being considered. It should also be noted that there are other Superfund projects where 50 mg/kg has been considered as a cleanup level. For example, in USEPA's summary of potential remedial approaches document issued in May 2012 for the Housatonic River Project (<http://www.epa.gov/region1/ge/thesite/restofriver/reports/508662.pdf>), the potential approach includes hot spot remediation to address surface sediment or riverbank soil exceeding 50 mg/kg. In addition, the target cleanup standard for the Lower Harbor and Bay at the New Bedford Project was established at 50 mg/kg (1998 ROD and 2011 Final – Fourth Explanation of Significant Differences [ESD]), the Grand Calumet site had a 50 mg/kg sediment removal target level in select areas, and the Ottawa River project for the Unnamed Tributary had a target cleanup level of 50 mg/kg (<http://www.epa.gov/glnpo/sediment/OttawaRiver/ottawa.pdf>).

This comment states that “*The last major site in Region 5 to use a 50 ppm RAL for PCBs was the Waukegan Harbor Site. This resulted in the failure of the cleanup with respect to remaining high risks to fish consumers.*” In actuality, it is the resulting SWAC that determines the effectiveness of exposure control, not the RAL; therefore, depending on site-specific distributions of PCBs (among other factors) equal action levels are expected to have different levels of effectiveness in reducing exposure among different sites. Furthermore, the Agencies' use of a 10 mg/kg RAL in Portage Creek was not formally founded on a risk basis and in applying the 10 mg/kg criterion, practical considerations were also made on where it could and would be applied.

MDEQ Key General Comment 3:

Given the (1) uncertainty in avian toxicity reference values (TRVs) and their application to evaluation of site-related risks to birds, especially since risks associated with the non-dioxin like effects of PCBs are not considered in the terrestrial baseline environmental risk assessment (BERA), and (2) limited toxicity database for small wild mammals exposed to PCBs in soil, RALs of 20 and 25 ppm may not be sufficiently protective of small home range avian and mammalian species exposed directly or indirectly to floodplain soils. RALs of 10-15 ppm may be more appropriate given these uncertainties and data limitations. Graphical presentations (Figures 5-12, 5-19 and 5-20) provided in the ASTM are confusing and do not assist risk management decision making. These figures should be removed and replaced with more discernible and useful evaluations that show how a RAL provides an exposure point concentration (EPC) protective of the majority of species and achieves the objective of the Revised RAO #3.

Response

As with other parts of the Area 1 ASTM, Figures 5-12, 5-19, and 5-20 were developed in collaboration with decision makers across a series of ASTM/FS planning meetings. These figures

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were developed based on requests by the Agencies, drafts were prepared and reviewed with the Agencies, and refinements were made based on Agency input. The justification for an RAL of 20 mg/kg is presented in the Area 1 ASTM and USEPA and MDEQ verbally concurred with this approach during those planning meetings. Figures 5-17 and 5-18 show the EPCs that would result from the implementation of each candidate RAL and Figure 5-19 demonstrates how the EPCs compare to the relevant RBCs. For example, the implementation of an RAL of 20 mg/kg for the 1-acre moving window results in 100% of EPCs being below the lowest observed adverse effect level (LOAEL) RBC and 98% being below the geometric mean of the no observed adverse effect level (NOAEL) and LOAEL RBC. It is noted that an RAL of 25 mg/kg, although presented in the analysis in the Area 1 ASTM, was not taken forward into any of the alternatives for Area 1.

It should also be noted that the environmental values to be protected (i.e., the assessment endpoints) are defined in the Area 1 Terrestrial Baseline Ecological Risk Assessment (Area 1 TBERA) as the sustainability of local populations (including insectivorous birds, vermivorous birds, carnivorous birds, vermivorous mammals, and carnivorous mammals [ARCADIS 2012]). Thus, an RAL does not have to be protective of 100% of all possible individuals to sustain a local population and to be included for consideration.

MDEQ Key General Comment 4:

Floodplain RALs have not been evaluated for the transport of contaminants to the aquatic environment resulting from inundation, erosion, and surface water runoff and, therefore, may prevent revised RAOs #1 and #2 from being achieved. As a result, an additional RAO needs to be developed that focuses on reducing transport from floodplain soils and banks.

RAO 5: Reduce transport of PCBs from riverbank and floodplain soils to the Kalamazoo River. This RAO is intended to reduce the rate of transport of PCBs from riverbank and floodplain soils to the Kalamazoo River at levels that pose risk to human health or the environment.

PCBs are known to be rapidly bioaccumulated by fish, even over short exposure times of just a few days. A study conducted by the MDEQ in 2001 and 2004 in the Trowbridge area found that PCB concentrations in semi-permeable membrane devices (SPMDs), surface water, and sediment were several fold higher in periodically inundated floodplain areas than in the Kalamazoo River (Santini, et.al, Impact of PCB contaminated Floodplain Sediment on Risk Management Decisions 2005, Third International Conference on Remediation of Contaminated Sediments). Specifically, SPMDs which model PCB uptake in fish and other aquatic biota, averaged three times higher in inundated floodplain areas than those placed in the river. Surface water PCB concentrations were 2 to 10 times greater and sediments 3 to 600 times greater in

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floodplain areas than in the river. While PCB concentrations in the Trowbridge test area are higher than those in Area #1, the results of the Trowbridge study illustrate the potential risks associated with inundation.

To partially address this concern, the Willow/A-Site Operable Unit (OU) adopted a period of inundation criterion to be protective of ecological receptors by applying in-stream criteria to those areas that could potentially be submerged for an ecologically relevant period of time⁴.

Wetland areas will be further evaluated during the remedial design (RD) phase of the remedy. During the RD phase of the remedy, a scientifically valid indicator of wetland inundation period will be established in order to determine where a sediment-to-fish-to-consumer exposure pathway in OU2 wetland areas presents an unacceptable risk to consumers (people or mink) of fish. If, after applying the inundation period indicator to a wetland area a sediment-to-fish-to-consumer exposure pathway is determined to present an unacceptable risk to consumers of fish, then the more conservative aquatic sediment criteria established in the human health risk assessment (HHRA) will be applied to protect people who consume the fish. The aquatic sediment criteria established in the HHRA ranges from 0.04 mg/kg to 0.30 mg/kg PCB; however, because the MDEQ has a detection limit of 0.33 mg/kg for PCBs, the cleanup criteria protective for people consuming fish defaults to 0.33 mg/kg. The sediment cleanup criteria of 0.33 mg/kg PCB is also protective of fish-eating animals. If after applying the inundation period indicator to a wetland area a sediment-to-fish-to-consumer exposure pathway is determined not to present an unacceptable risk to consumers of fish, then a cleanup level that is within the acceptable no observed adverse effect levels (NOAEL)/lowest observed adverse effect levels (LOAEL) range of 6.5 mg/kg to 8.1 mg/kg PCB will be applied to these wetlands to protect terrestrial ecological receptors.

The 20 and 25 ppm PCB floodplain RALs for the former Plainwell Impoundment leave a few areas (Figures A-12, A-13) immediately adjacent to the river with PCB levels around 15 ppm that are potentially subject to inundation and erosion. Former Plainwell Dam #2 also has expansive areas in the 1-5 ppm range (A-32) and large areas of 5-10 ppm along the river. This area is known to have frequent inundation. Unlike the removals done at the Plainwell Impoundment, it does not appear that a bank criterion of 5 ppm was applied.

The Area 1 Supplemental Remedial Investigation (SRI) found that sediment PCB levels as low as 0.07 ppm may ultimately be needed to fully protect human health. The Fox River selected a remedial sediment target of 0.25 ppm following removal/containment of sediments greater than 1 ppm PCB, with the 0.25 ppm value being further reduced to

⁴ From Page 21 of the OU2 ROD

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lower risk-based targets over 10-30 years. Plainwell Dam #2 has areas contaminated with PCBs that are two orders of magnitude above levels protective of human health and ecological receptors. There is every need to take a similar approach for the Kalamazoo River as was taken for the Fox River, not only to achieve consistency within the region but due to the fact the PCB risks at the Kalamazoo are no less significant than at the Fox.

The ASTM needs to fully address risks from inundation, erosional, and surface water runoff since elevated concentrations of PCBs in the former Plainwell Impoundment or Plainwell Dam #2 are very proximal to the river and may be subject to significant inundation or erosion.

Response to Paragraph 1

Eroding riverbank soils resulting from drawdown of the State-owned dams have been addressed by the two completed time-critical removal actions (TCRAs) in the former Plainwell Impoundment and Plainwell No. 2 Dam Area. Pre-design information showed the potential and degree to which these areas were contributing to PCB transport to downstream areas. Post-TCRA monitoring shows the extent to which downstream transport was reduced following the TCRA projects. The available information does not show the floodplains to be an important continuing source. There is no evidence that PCBs from the floodplains outside of the former impoundments are reaching the river at rates that might drive exposure to fish so as to cause unacceptable risks to fish-eating receptors. There is the possibility that the floodplains are *sinks* for PCBs rather than serving to export PCBs to the river. In any case, transfer or flux of PCBs between the river and floodplain is likely at low rates compared to annual transport associated with other sources and transport processes. The floodplain soils represent a possible continuing low level source, along with the other low level watershed sources – including continuing inputs from Morrow Lake.

Given that bank erosion sources have already been controlled and the lack of any data indicating that any important sources remain, or that the floodplain contributes important quantities of PCBs, incorporation of the suggested RAO is not appropriate – although it may be for downstream areas if bank stabilization has not been completed yet.

Response to Paragraph 2

The SPMD study cannot be broadly applied to floodplain soils, due to differences between the wetland area in Trowbridge in which the study was performed, and the majority of the floodplains. ARCADIS contends that this localized study is not broadly applicable as the differences in biological uptake among the different types of floodplain areas has not been fully developed (i.e., there are a number of factors that could be causing the higher SPMD results besides PCBs in the soils alone).

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Response to Paragraph 3

Although use of an inundation study was considered in the Willow Boulevard/A-Site OU (WB/A-Site OU), this study was not carried forward in the determination of a cleanup criterion for the WB/A-Site OU. The sediment criterion was broadly applied to ancillary areas as a means to finalize the Consent Decree (CD). Moreover, it was well documented throughout this process that 0.33 mg/kg would not become a precedent cleanup criterion for the rest of the site (see Appendix C – Statement of Work to the CD).

Response to Paragraph 4

To address low-lying areas along the river that may be frequently inundated (therefore displaying sediment characteristics), the area and volume of sediment was increased by 5% in Area 1 to account for these areas in the 1 mg/kg RAL alternative evaluated in the Area 1 FS Report. USEPA and MDEQ verbally concurred with this approach in prior planning meetings.

Response to Paragraph 5

As stated in the Area 1 ASTM, an RAL of 20 mg/kg results in 98% of possible 1-acre home ranges having concentrations below the lowest recommended PRG of 11 mg/kg and 100% below the second PRG of 18 mg/kg within the former Plainwell Impoundment. Furthermore, current conditions in the former Plainwell Impoundment and the Plainwell No. 2 Dam Area combined are protective of approximately 87% of possible home ranges, which is above the 80% goal assumed to be protective of local populations.

As identified in the approved *Plainwell No. 2 Dam Area Time-Critical Removal Action Design Report* (ARCADIS 2009), banks containing PCBs at concentrations greater than 5 mg/kg were targeted for removal; however, there were a few locations where sections were dropped from the remedial footprint, primarily due to constructability concerns.

Response to Paragraph 6

Area 1 should not be patterned after the Fox River, but rather should be based on site-specific processes and characteristics unique to Area 1. To that end, the site-specific risk assessments were used to identify a PRG that would be protective of human and ecological receptors and provide the means for gauging the effectiveness of a remedy relative to achievement of the RAOs. Sediment cleanup work performed along the Kalamazoo River in Area 1, including work done by USEPA, has used a cleanup criterion of 1 mg/kg. The Area 1 ASTM takes the approach of applying a SWAC-based PRG of 0.33 mg/kg.

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It should also be noted that other Region 5 projects have SWAC targets higher than 0.33 mg/kg (e.g., the Sheboygan River and Harbor, which has a long-term SWAC goal of 0.5 mg/kg as described in the 2000 ROD and 2010 ESD).

Response to Paragraph 7

No pathway of significance has been established for potential sources from low-lying floodplain areas. They may contribute to uptake of PCBs by fish and may potentially limit how low fish concentrations may decline; however, available data to quantify fish tissue PCB concentrations that may be present due to exposure to inundation of PCB-containing floodplain soils would be at levels that would present risk or warrant management considerations in the future.

MDEQ Key General Comment 5:

As for the Fox River (see Enclosure), consideration should be given to adding a RAO with an objective of attempting to achieve, to the degree practicable, surface water quality criteria in the Kalamazoo River.

RAO 6: Achieve, to the extent practicable, surface water quality criteria for the Kalamazoo River. This RAO is intended to reduce PCB concentrations in surface water as quickly as possible. The current water quality criteria for PCBs are 0.026 nanograms per liter (ng/L) for the protection of human health, and 0.12 ng/L for the protection of wildlife. (Ref: Rule 323.1057 [Toxic Substances] of the Part 4. Water Quality Standards of Part 31, Water Resources Protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended [NREPA]).

Response

Inclusion of a new RAO specific to surface water quality is not necessary as the water quality criteria identified above are included in the listing of chemical-specific ARARs. These chemical-specific ARARs are evaluated against each alternative in the Area 1 FS Report under the compliance with ARARs criterion. Compliance with ARARs is one of the threshold criteria that each alternative must meet, unless it is determined that a waiver can be applied to specific ARARs. Furthermore, no explanation is provided for the qualifier "*This RAO is intended to reduce PCB concentrations in surface water as quickly as possible*" used in the requested RAO rewrite. As explained in responses to previous comments, time is only one of multiple considerations in evaluating achievement of RAOs, and all of those considerations do not get described in the RAO itself. These considerations include minimizing disruption and risk to the local community and minimizing impact to habitats. The proposed RAO has not been taken forward into the Area 1 FS Report.

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MDEQ Specific Comment 1:

Section: Executive Summary, Page: ES-2, Paragraph/Table: 1st Soils Bullet

The statement, "Floodplain soil data show that flooding of the Kalamazoo River has not resulted in appreciable accumulation of PCBs in the natural floodplains (i.e., areas not influenced or inundated by the historical operation of dams) (BBL 1994)." is based on few samples over a great area. This conclusion needs to state the area and number of samples upon which it is based to inform the reader of the limited data set.

Response

Multiple studies included floodplain soils:

- 1993 Floodplain Investigation: 36 samples from 16 locations
- 1993 Portage Creek Floodplain Investigation: 22 samples from 10 locations
- 1993/1994 Former Impoundment Sediment Investigation: 147 samples from 42 locations
- 1995 Portage Creek Floodplain Investigation: 9 samples from 3 locations
- 2000 MDEQ-directed Focused Sediment Sampling: 92 samples from 30 locations
- 2003 Plainwell Floodplain Soil Sampling: 82 samples from 82 locations
- 2008 Bank Soil Sampling: 33 samples from 11 locations
- 2008 Plainwell No. 2 Bank Soil Sampling: 265 samples from 78 locations
- 2008 Plainwell No. 2 Floodplain Soil Sampling: 302 samples from 95 locations
- 2009/2010 Crown Vantage Investigation: 32 samples from 10 locations

In addition several agency collected datasets were considered during the evaluation of floodplain soil, including:

- 2001 EPA Phase I Sampling: 145 samples from 38 locations
- 2001 EPA Phase II Sampling: 612 samples from 94 locations
- 2001 CDM Resample of EPA RA Sites: 57 samples from 10 locations
- 2008 Plainwell Investigation: 376 samples from 107 locations

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The results of these sampling investigations are discussed in Section 6 of the Area 1 SRI Report and summarized in Tables 6-31 and 6-32. As indicated above, these areas included floodplains of the Kalamazoo River in Area 1 and two areas in Portage Creek, as well as targeted sampling by the State. This sampling effort targeted areas considered representative of the potential conditions and PCB levels contained in other unsampled areas. The data gathered to date indicate that there is no basis for additional sampling. Reference to the total number of samples has been added to the revised Area 1 ASTM.

MDEQ Specific Comment 2:

Section: Executive Summary, Page: ES-3, Paragraph/Table: Surface Water - Bullet 1

Provide citation and calculations to document stated 80% reduction at Main Street in Plainwell. Note that this could be due to laboratory analytical method differences (e.g., BBL aroclor vs. MDEQ congeners) or lack of data from early 2000s to establish a baseline. Also note that use of Main Street bridge does not contain all the flow of the Kalamazoo River (i.e., the flow splits through the Mill Race).

Response

Table 7-5a of the Area 1 SRI Report presents the Calculations for the Flow-Stratified Estimates of Annual PCB Load in the Kalamazoo River. The total flow-stratified PCB load estimate in 2000-01 was 11 kilograms (kg) and the total flow-stratified PCB load estimate in 2006-10 was 2.0 kg (an approximately 82% reduction). A reference to this document/table has been added to the revised Area 1 ASTM.

MDEQ Specific Comment 3:

Section: Executive Summary, Page: ES-3, Paragraph/Table: Surface Water - Bullet 2

Provide citation and calculations for stated 40% of load come from Portage Creek and Morrow Lake outlet. Estimate contribution from Portage Creek relative to over Morrow Dam.

Response

Tables 7-5a and 7-5b of the Area 1 SRI Report present the Calculations for the Flow-Stratified Estimates of Annual PCB Load in the Kalamazoo River and Portage Creek, respectively. The 2006-10 combined total flow-stratified PCB load estimate at Plainwell was 2.0 kg and the combined total flow-stratified PCB load at Portage Creek (0.32 kg) and River Street (0.44 kg) was 0.76 kg (approximately 38% of the Plainwell load). A reference to this document and the tables has been added to the revised Area 1 ASTM.

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MDEQ Specific Comment 4:

Section: Executive Summary, Page: ES-3, Paragraph/Table: Banks

The conclusion that bank PCB mass is small and is not a significant source of PCBs to the river must acknowledge the limited data set and assumptions upon which it is based. This source must be carried forward as a potential risk should developed alternatives not result in achievement of one or more RAOs after completion of the remedy.

Response

See the response to Specific Comment 1 for a list of the studies that have been performed in the floodplain to provide for analysis and conclusions regarding PCB levels and loading to the river.

The results of these sampling investigations are discussed in Section 6 of the Area 1 SRI Report and summarized in Tables 6-31 and 6-32 of that document. We believe these data are adequate to support the stated conclusion regarding low PCB mass inventories and low PCB source contribution. The available data do not support that a pathway from PCBs in soils in the natural floodplains or outside of the former impoundments represents a significant risk to the river. We disagree that this source should be described as a potential risk. It is very likely that the selected remedy will require long-term monitoring and 5-year reviews wherein achievement of RAOs will be tracked and if RAOs are not achieved, the likely reasons would be evaluated.

MDEQ Specific Comment 5:

Section: Executive Summary, Page: ES-4, Paragraph/Table: RAOs

Revise/add per general comments

Response

As outlined in the responses to MDEQ General Comments, the text to RAO 1 was revised; however, no other changes to the RAOs are proposed.

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MDEQ Specific Comment 6:

Section: Executive Summary, Page: ES-4, Paragraph/Table: Last

Remedial approach for sediments: the 0.33 mg/kg "default detection limit" is not a risk-based concentration or goal and should not be treated as a PRG. PRGs should be risk-based in accordance to USEPA guidance and the USEPA approved BERA and HHRA. PRGs should be developed in accordance with 10^{-4} , 10^{-5} , 10^{-6} and $HQ = 1$ risk thresholds on a spatially relevant scale, given receptor scenarios. Each alternative developed in the FS should be evaluated against its ability to meet these thresholds, at the completion of proposed remedial activities and at periodic intervals thereafter, assuming some monitored natural recovery for those areas where fish tissue concentrations are documented to be decreasing.

The ability to achieve these PRGs immediately following construction and following a longer term recovery period should be considered during the development of remedial action alternatives. For example, what RAL is necessary to achieve a sediment concentration of 0.12 mg/kg on a SWAC basis. SWACs should be developed over an appropriate spatial scale that takes into account fishing patterns and species home range.

Response

See the response to General Comment 2 regarding the selection of 0.33 mg/kg as a PRG and the volume/SWAC/mass evaluations for additional RALs.

MDEQ Specific Comment 7:

Section: Executive Summary, Page: ES-5, Paragraph/Table: First

Hot Spot Analysis and RALs: The concept of targeting hot spots to eliminate mass is only sound if it can be linked to risk reduction. The Executive Summary states that targeting the hot spots, which represent 40 percent of the remaining PCB mass, will reduce the SWAC from 0.53 to 0.48 mg/kg. We should be targeting greater SWAC reductions. The USEPA directed RAL of 1 mg/kg accomplishes this. Further evaluation of additional RALs is required along with a comparison of the SWACs to the risk-based goals and some assessment of the degree to which further reductions through MNR will allow achievement of RAOs.

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Response

See the response to General Comment 2 regarding the selection of 0.33 mg/kg as a PRG. The rationale for the statement that "we should be targeting greater SWAC reductions" is not clear.

It is noted that the selected cleanup approach for Portage Creek was not evaluated as to whether technically sound on the basis of risk considerations, but rather relied on practical judgments as to where deposits of higher PCB concentration material would be targeted for removal, and where smaller deposits would be left in place due to access limitations and other considerations.

MDEQ Specific Comment 8:

Section: Executive Summary, Page: ES-6

Development of Remedial Alternatives: Additional alternatives should be developed. After the No Action and MNR/Institutional Controls alternatives, there should be an alternative that targets all the hot spots, and a series of intermediate alternatives that target additional RALs (see General Comments).

Response

Justification for development of the current list of alternatives is included in the Area 1 ASTM, and MDEQ participated in meetings to develop that list. The rationale for developing other alternatives or for evaluating intermediate RALs has not been provided. During our July 23, 2012 planning meeting, it was agreed that the mass/volume/SWAC relationships in consideration of a range of candidate RALSs would be provided in the revised Area 1 ASTM (see Section 5.1.4). The list of alternatives has been discussed over two prior meetings and was also presented within the Area 1 FS Report outline, which was shared with MDEQ on June 14, 2012. After review of the Area 1 FS outline in August, MDEQ indicated in an email sent on August 8, 2012 that they had reviewed and had no specific comments on the outline. The alternatives presented in the Area 1 ASTM and carried forward into the Area 1 FS Report were therefore those reviewed, discussed, and agreed upon during the planning stage.

MDEQ Specific Comment 9:

Section: Executive Summary, Page: ES-6, Paragraph/Table: Table ES-2

The soils row is misleading. If floodplain soils to be removed are 0.26 acres in size, why is the areal extent of excavation value given as 75? Revise table for clarity.

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Response

Tables ES-2 and 5-10 have been revised. The Areal Extent of Excavation is 3.5 acres for sediment and 0.26 acres for soils.

MDEQ Specific Comment 10:

Section: 1, Page: 1-3, Paragraph/Table: 3-4

A recurring concept is that former Plainwell banks were unstable, deeply incised, and highly erodible compared to the "natural" areas of Area 1 that are less erodible and in dynamic equilibrium. This is not supported with data. It could be argued that clay banks in the former impoundments are less erodible and more stable than a "natural" portion of the river composed of sand/gravel/clay. Older BBL documents describe these banks as "slowly eroding" which is contrary to recent documents (see page 3-12 that describes time critical removal areas [TCRA] as eroding at relatively high rates). If it is true, need a source(s) cited.

Response

The conceptual model of the Kalamazoo River, since the work of the State's contractors (e.g., GZA-Donahue 1990) has long recognized the prominence of the eroding river banks within the former impoundments as an important and controllable source of PCB loading to the Kalamazoo River. A review of the "older BBL documents", older MDEQ documents, and current documents indicates consistency over several decades regarding the erodibility of the banks in the former impoundments and its importance to PCB loading.

The estimated rates of erosion in the former Plainwell Impoundment were presented in both the 2000 RI Report (BBL 2000) and the Area 1 SRI Report (ARCADIS 2012), and both reports reflect the importance of the bank erosion PCB source. Section 3 of the 2000 RI Report describes steep, unstable banks that continued to erode. It is unclear why MDEQ would suggest that the significant levels of bank erosion caused by dam draw down, which is clearly not a natural condition, could somehow be viewed as presenting a higher degree of stability as compared to naturally eroding banks. We continue to believe that control of bank erosion sources of PCBs to the Kalamazoo River is a critical remediation need.

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MDEQ Specific Comment 11:

Section: 2, Page: 2-5, Paragraph/Table: Table 2-1

Work done at the Allied Paper Landfill (OU1) and the former Bryant Mill Pond TCRA should be included as response actions to control sources of PCBs to the Kalamazoo River.

Response

Summaries for both the Allied Paper Landfill and the former Bryant Mill Pond TCRA have been included in Table 2-1 of the revised Area 1 ASTM as requested.

MDEQ Specific Comment 12:

Section: 3, Page: 3-1

It is interesting to note the following quote describing sediment in BBL's 2000 SRI for the entire river, where the third conclusion outlined was "PCB concentrations in submerged sediment are low and relatively evenly distributed throughout the site. There are no apparent 'hot spots' where a large mass of PCBs is concentrated within a small volume of sediment."

The ASTM (and the Area 1 SRI) describes a river that is low in PCBs, with exceptions of hot spots, that 12 years ago did not exist. So, without sampling, these hot spots are not identified and, therefore, not addressed. The MDEQ believes additional sampling in Area 1, targeting top of bank and/or toe of slope locations, and also mid-channel/near bank locations in-stream, is warranted. At a minimum, reconnaissance and documentation of materials observed should be done to highlight additional hot spots. The SRI and this ASTM do a poor job at explaining why the hot spots were found in certain areas of Area 1, and both documents are not adequate at using existing data to potentially identify other hot spot locations.

Response

At the time of writing the 2000 RI Report, no hot spots (i.e., areas where a large mass of PCBs concentrations within a small volume of sediments) had been identified – however, a hot spot assessment objective was not incorporated in the 2000 RI. Although a hot spot assessment was performed as part of the Area 1 SRI, results show these areas present minimal risk reduction opportunity due to their small size so the 2000 RI Report findings concerning nature and extent of PCBs were not in error. The hot spot assessment effort identified several areas with

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disproportionate PCB mass per unit volume, and these areas were subsequently identified as "hot spots," albeit the PCB mass found in these areas is still a minor fraction of the Site-wide PCB inventory. The hot spot assessment also showed that other sample locations with high PCB concentrations *did not* represent hot spots. The documents are not inconsistent in their assessment of the PCB-containing sediment within the system – they simply use different terminology and the SRI specifically included the hot spot assessment objective.

ARCADIS disagrees with the MDEQ comment – the Area 1 SRI Report clearly explains that "hot spots" occur in the urban area of Kalamazoo, primarily because it is a slow flowing depositional reach. The Area 1 ASTM provides a summary of the key Area 1 SRI findings, but does not include full descriptions as given in the Area 1 SRI Report. Furthermore, the Area 1 ASTM presents the proposed approach for estimating additional hot spot areas, and includes alternatives to target these additional areas. As explained in the Area 1 ASTM, further sampling could be included at the remedial design phase if the additional areas were included in the proposed plan by USEPA.

MDEQ Specific Comment 13:

Section: 3, Page: 3-2, Paragraph/Table: Table 3-1

Where is Crown Vantage data? If it is included in Section 4 channel sediment, it should be broken out separately, as done with the hot spots.

Response

Crown Vantage has been included in a separate line item within Table 3-1 as requested.

MDEQ Specific Comment 14:

Section: 3, Page: 3-2, Paragraph/Table: Table 3-1

There is a discrepancy in the PCB mass. BBL's 2000 remedial investigation (RI) estimate (Table 4-3) for the same stretch was 1099 kg; however, adding up the mass in Table 3-1 to Main Street in Plainwell, we only get 551 kg (total of 620- 69 from impoundment). Why is the mass estimate more than half of what it once was? Did the calculations methods change? Did the samples collected redefine the mass in half?

Response

The calculation methodologies were essentially the same with some modifications to account for additional supplemental sampling in 2000 and sampling conducted as part of the Area 1 SRI.

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Please see Appendix J of the approved Area 1 SRI Report for the description of the PCB mass calculation methodology.

MDEQ Specific Comment 15:

Section: 3, Page: 3-3, Paragraph/Table: 2nd bullet

It does not appear that the SWAC for Plainwell includes all MDEQ samples and/or all samples considered to be post-TCRA. We assume that ARCADIS did not use in-stream MDEQ samples from "F" and "G" areas, which have high concentrations, and they might not have used all the samples from within/adjacent to our other sediment areas.

Response

The SWAC (1.3 mg/kg) presented in the Area 1 ASTM does not include the post-TCRA MDEQ sampling conducted in 2008. The impact of these biased sediment samples was evaluated in the approved Area 1 SRI Report at the request of MDEQ.

As documented in the approved Area 1 SRI Report, several sediment samples were excluded from the exploratory analysis. The rationale for exclusion of these samples was provided in the approved Area 1 SRI Report on pgs. 6-41 to 6-42, and included the following:

"Prior to analysis, the MDEQ 2008 sediment sample locations were plotted in GIS along with the delineated sediment feature boundaries provided to ARCADIS by MDEQ's consultant (CDM) on September 1, 2011 to assess the correspondence between the features delineated and targeted and the resulting samples. Upon review of the sediment locations relative to the targeted feature boundaries, a number of the sediment locations that could be associated with a defined sediment feature based on the location ID (e.g., S-D1) fall outside of their targeted feature boundaries. Based on this observation, only those sediment samples that were reasonably assumed to be collected within a target sediment feature were included in this sensitivity analysis and the subsequent PCB mass, volume, SWAC sensitivity calculations. Based on review of the CDM sampling report, sampling performed at locations S-C1B, S-F1B, and S-G2B may have been targeted to specific types of materials based on field observations, and may not be representative of average concentrations in the target feature – these samples were also excluded."

After accounting for these biased samples and uncertainty associated with the sampling, the impact of these biased sediment samples was clearly stated in the approved Area 1 SRI Report (Pg. 6-42):

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"After accounting for these features within the overall River Section 8 area, the River Section 8 PCB SWAC increases from approximately 1.3 mg/kg to 1.4 mg/kg."

Due to the bias and uncertainty associated with these samples, the SWAC of 1.3 mg/kg is presented and used in the Area 1 ASTM.

MDEQ Specific Comment 16:

Section: 3, Page: 3-3, Paragraph/Table: 3rd bullet

MDEQ sampling was conducted in the fall 2008, mostly upstream of US-131 and, at that time, the majority of the cleanup in this area was completed. Therefore, most if not all of these sediment areas still exist, contrary to the impression given to the reader.

Response

The Area 1 ASTM text has been revised to specify that the survey and associated results correspond to areas downstream of US-131. Note that the extent of these materials and whether they remained following completion of the project is still unknown and, as identified in the Area 1 ASTM, it is likely that residual PCB concentrations in channel sediments in this reach will continue to attenuate as the river approaches a new equilibrium between erosion and deposition following dam removal. New deposits are not anticipated to form in this area.

MDEQ Specific Comment 17:

Section: 3, Page: 3-4, Paragraph/Table: 2nd and 3rd bullets

The MDEQ fundamentally disagrees with the characterization of the hot spot assessment areas, their potential sizes, quantity and likelihood of being present. The use of 50 mg/kg as a threshold for evaluation is extraordinarily high and should never have been a criterion for defining hot spots. Because it is clear that Georgia-Pacific and the USEPA will not support additional SRI to address hot spots in Area 1, the MDEQ requests that this issue be stated as unresolved and that FS alternatives continue to contemplate the effectiveness of the remedy in light of the potential for additional, unaddressed hot spots to exist.

Response

The use of 50 mg/kg as a basis for hot spot identification was discussed and approved by USEPA in planning of the hot spot assessment. Furthermore, the Area 1 SRI Report and the Area 1

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ASTM both acknowledge the potential for additional assessment. The Area 1 FS includes alternatives that address potential additional hot spot areas.

MDEQ Specific Comment 18:

Section: 3, Page: 3-12, Paragraph/Table: Top

Acknowledge that unremediated areas of Area 1, including in-stream, bank, and floodplains are ongoing sources of PCBs to the river, not just upstream, air, and urban sources.

Response

The text in Section 3 has been revised to read "Low-level continuing sources of PCBs from the atmosphere, upstream areas, and urbanized areas of the watershed, and unremediated Area 1 sediments and floodplain soils may ultimately contribute to limitations on the lowest achievable levels of PCBs in fish."

MDEQ Specific Comment 19:

Section: 3, Page: 3-13, Paragraph/Table: Footnote 4

Footnote 4 notes that approximately 1.5 miles of riverbank from d/s end of Willow Boulevard to Portage Creek confluence was not included in the potential bank erosion because of ". ..comparatively very litter river bank area subject to erosion..." in this reach. This reach should be included.

Response

This additional segment of the river bank has been included in the total length of bank incorporated in the estimates presented.

MDEQ Specific Comment 20:

Section: 3, Page: 3-13, Paragraph/Table: Item 1

Describe the number of floodplain samples used in the calculations that were near (within 10 feet of) the bank.

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Response

The table provided in Section 3 includes input parameters used in the calculation and the results for each step of the calculation. Bounding estimates of the annual PCB load from the remaining bank areas and volume of PCB-impacted soils have also been incorporated in this table. The number of samples used in the calculations has been included in the revised table.

MDEQ Specific Comment 21:

Section: 4, Page: 4-2, Paragraph/Table: 4.1.1

Fish should also be included in the text, as there should be chemical specific applicable or relevant and appropriate requirements (ARARs) and to be considered (TBCs).

Response

A paragraph describing the chemical-specific ARARs and TBCs related to fish has been included in the text of Section 4 as requested. This information is currently included on Table 4-1.

MDEQ Specific Comment 22:

Section: 5, Page: 5-1, Paragraph/Table: 1

RBCs: the discussion of RBCs should note specifically that RBCs can be developed for fish tissue. A PRG on fish tissue should be considered for inclusion in the FS.

Response

The impact of each alternative on reducing fish PCB concentrations over time is included in the Area 1 FS Report based on the resultant sediment SWAC and application of a biota sediment accumulation function. This approach is consistent with that implemented at other sites, for instance the Sheboygan River and Harbor Super Site which utilized an average PCB sediment concentration value to calculate resulting risk and corresponding PCB tissue levels in fish based on site-specific biota sediment accumulation factors. However, time to achieve protectiveness was not included in the RAOs, rather this performance metric was considered along with the others in the evaluation of the alternatives.

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MDEQ Specific Comment 23:

Section: 5, Page: 5-2, Paragraph/Table: 2

The discussion of PRGs should note that sediment PRGs can be developed based on tissue RBCs through use of a food web model or other means of establishing tissue sediment relationships (e.g., biota-sediment accumulation function). All of the RBCs developed in the USEPA approved risk assessments need to be presented and evaluated with respect to developing a PRG. The 0.33 mg/kg Part 201, Environmental Remediation, of the NREPA, threshold is not a risk-based criteria and should only be applied after the risks have been fully discussed. The relationship between fish tissue and sediment PCB concentrations has been evaluated by the MDEQ (Kern, "Considerations and Statistical Approaches Regarding Spatial and Temporal PCB Trends in Area 1," 2011).

Response

An assessment of the changes in PCB concentrations in fish tissue over time has been provided within the Area 1 FS Report (see Appendix E). A spreadsheet-based model has been utilized to estimate potential changes in fish tissue PCB concentrations over time resulting from implementation of each alternative. The methodology used to develop these predictions is consistent with that described at the Area 1 FS planning meeting held July 23, 2012 in Romulus, MI.

MDEQ Specific Comment 24:

Section: 5, Page: 5-3, Paragraph/Table: Figure 5-2

Figure 5-2 demonstrates that most of the PCB mass is between RM 68.5 and 73. Development of an alternative that includes active remediation of this entire reach should be considered. Active remediation would include enhanced MNR, in-situ treatment, capping and dredging to varying degrees based on site specific factors. This would be an excellent way to rapidly reduce PCB levels within the Kalamazoo River.

Response

See the response to Specific Comment 8 regarding past discussions pertaining to the development of alternatives. A comparison between the PCB mass of the whole reach and just the hot spots has been added to Table 5-1 of the revised Area 1 ASTM to clearly define the reason for targeting only the hot spots.

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MDEQ Specific Comment 25:

Section: 5, Page: 5-3, Paragraph/Table: Figure 5-2

The ASTM should present a sediment map that depicts the spatial distribution of sediment concentrations. An interpolated surface could be used to identify other areas that may warrant active sediment remediation. At this point, the assumption is that there are only the identified hot spots that should be targeted in addition to the USEPA directed RAL of 1 ppm. Additional data analysis may identify other areas that should be targeted. Additional analysis should not be limited to interpolations but could rely on other tools such as making assumptions about the mass of sediment associated with given elevated sediment levels.

Response

The mapping generated to depict the sediment concentrations was discussed as part of the Area 1 SRI process, with figures developed based on the agreed upon approach. Adequate data do not exist over the great majority of Area 1 to allow for creation of new figures with interpolated surfaces.

The Area 1 SRI Report, the Area 1 ASTM, and the Area 1 FS Report all acknowledge the potential need for additional assessment of hot spots. Further, two sediment alternatives (SED-5A and SED-5B) include mass, areas, and volume associated with potential unidentified hot spots. These alternatives have been evaluated in the Area 1 FS Report.

MDEQ Specific Comment 26:

Section: 5, Page: 5-4

The SWACs presented in Table 5-1 are just for the hot spot areas. The overall reduction in sediment concentrations as a result of the hot spot removal actions is far less impressive. In addition, as presented in Figure 5.8, there are numerous sample locations that exceed 1 mg/kg, 5 mg/kg, and 10 mg/kg. Based on this analysis, it seems reasonable to identify additional RALs for evaluation in the draft FS.

Response

See the response to General Comment 2; an evaluation of RALs has been included in Section 5.1.4 of the Area 1 ASTM. The reduction in the Area 1 sediment SWAC as a result of hot spot removal has been added to Table 5-1; however, no further RALs are proposed for inclusion in the Area 1 FS.

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MDEQ Specific Comment 27:

Section: 5, Page: 5-4, Paragraph/Table: Table 5-1

RAL verses post remedial SWAC relationships should be developed to support the development of alternatives that address contamination between the hot spot areas and the USEPA directed RAL of 1 ppm. See enclosed spreadsheet/graph developed by Kern for examples (9_LU_UnbiasedSedimentPCBs_Area1.xlsx).

Response

See the response to General Comment 2; an evaluation of RALs has been included in Section 5.1.4 of the Area 1 ASTM.

MDEQ Specific Comment 28:

Section: 5, Page: 5-7, Paragraph/Table: Table 5-2

It is worth noting that the analysis presented in Table 5-2 results in a SWAC of 0.17 mg/kg- comparable to that of the Fox River. However, because of the way Table 5-2 is portrayed, it is presented as an extreme amount of remediation. At a minimum, another scenario should be added: 500 ppb as a RAL.

Response

See the response to General Comment 2 regarding the Fox River precedent. It is not clear why 0.5 mg/kg should be included, when the 1 mg/kg RAL scenario already achieves the proposed PRG SWAC of 0.33 mg/kg.

MDEQ Specific Comment 29:

Section: 5, Page: 5-7, Paragraph/Table: Table 5-2/Note 6

The MDEQ does not agree that it is appropriate to use the outermost sediment stream tube to estimate bank soil concentrations. Previously, ARCADIS used samples within 10 feet from the bank to determine bank concentrations. Bank estimates should be tied to some data analysis of paired bank and in-stream correlation.

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Response

The stream tube method was adopted in the assessment of the additional 5% sediment area and volume in the 1 mg/kg RAL scenario because it is thought to more accurately represent the areas of the bank that are subject to routine wetting and drying due to fluctuations in the river elevation. The samples identified for the bank source (floodplain) contribution extended up to 10 feet from the top of bank and are not considered to be representative for a sediment scenario.

MDEQ Specific Comment 30:

Section: 5, Page: 5-8, Paragraph/Table: Table 5-3

The hypothetical additional hot spot row within this table provides such limited information as to be of questionable value. RALs of 10, 5, 2, and 0.5 ppm must be added (in addition to the hot spots) to develop the necessary information to evaluate remedial options for the site. There should not be a presumption that the areas that exceed the RAL must be removed. Rather, a range of technologies for these areas should be evaluated based on site specific information.

Response

The estimated values for the volume and post-remedy SWAC are calculated based on assumed locations for the unidentified hot spots in the Area 1 FS Report. Potential locations for unidentified hot spots were provided in the approved Area 1 SRI Report (Figures 6-12a and 6-12b), and two of these areas were selected for inclusion as part of the potential unidentified hot spots. Additional assumptions and details specific to these unidentified hot spots (including, volume, PCB mass, and SWAC) have been included in the Area 1 FS Report.

See the response to General Comment 2; an evaluation of RALs has been included in Section 5.1.4 of the Area 1 ASTM. Multiple representative process options were retained for developing a range of alternatives that address areas exceeding the stated RALs, including no further action, MNR, removal and capping. Note that capping was not retained for all areas that exceed the RAL based on considerations of water depths and flow velocities as described in Section 6.3.4 of the Area 1 ASTM. Based on these considerations, the sediment subject to potential remediation in the Crown Vantage area was determined to be the most conducive to cap placement.

**GEORGIA PACIFIC LLC
ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE
AREA 1 ALTERNATIVES SCREENING TECHNICAL MEMORANDUM**

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MDEQ Specific Comment 31:

Section: 5, Page: 5-9

Prepare figure similar to Figure 5-1 for floodplain soil PRGs and RALs. Add RBCs from Table 6-6 and 6-7 from final HHRA for reference. Also, 10-4 and 10-6 RBCs should be presented in addition to the 10-5 RBC for cancer risk endpoints.

Response

A figure relevant to floodplain soil PRGs that compares the RALs and the array of relevant RBCs and other applicable values has been prepared as requested and added to the revised Area 1 ASTM. The various RBC values have been discussed in the Area 1 ASTM.

MDEQ Specific Comment 32:

Section: 6, Page: 6-3, Paragraph/Table: 6.3.2

Engineering/Institutional Controls: Ancillary controls such as aids to navigation should be included as institutional controls. This should be presented in Table 6-1 and discussed in the Section 6 text.

Response

It is unclear what is meant by "Aids to navigation" and how they might improve the effectiveness of a remedy. Please provide additional information in order for ARCADIS to respond to this comment.

MDEQ Specific Comment 33:

Section: 6, Page: 6-4, Paragraph/Table: 6.3.3

Monitored Natural Recovery: Thin layer cover should more accurately be presented in the text as enhanced MNR. The purpose of the thin layer cover is to "enhance" natural deposition processes that can reduce contaminant concentrations more rapidly than MNR alone. This will also make the text consistent with Table 6-1.

Response

The text in Section 6 has been revised (consistent with Table 6-1) to clarify the identification of thin-layer cover as the representative process option for enhanced MNR.

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MDEQ Specific Comment 34:

Section: 6, Page: 6-4, Paragraph/Table: 6.3.4

In-Situ Containment: The capping discussion should include a discussion of reactive capping technologies that may be effective for PCBs and may allow placement of thinner caps which could be important to maintain water depth within the Kalamazoo River. Reactive capping should also be included in Table 6-1.

Response

The capping process option in Table 6-1 does include reference to the possibility of using sorptive media (e.g., organic carbon, organoclay) and/or physical barrier (e.g., an impermeable geofabric, clay, AquaBlok™) to improve isolation. However, for purposes of the alternative assembly and Area 1 FS evaluation, the cap is assumed to include a sand isolation layer with a gravel armor layer. The revised Area 1 ASTM also makes provision for inclusion of a thin-layer cover post removal if necessary. The final cap composition and thickness will be determined during the remedial design phase if capping or cover are included in the selected remedy.

MDEQ Specific Comment 35:

Section: 6, Page: 6-8

Treatment: Treatment should be included as a remedial technology. While ex-situ treatment is an option, the discussion should focus on in-situ treatment technologies which may be effective for low to moderate concentrations of PCBs. Reactive materials may also be used in conjunction with enhanced MNR.

Response

As identified in the approved *Multi-Area Preliminary Remedial Technology Screening Memorandum* (ARCADIS 2010), in situ treatment (physical, chemical, and/or biological) was not retained for the preliminary process option screening based on the applicability to floodplain soils at the Site and because the processes involved have not yet been sufficiently developed nor successfully implemented at full scale for PCBs. The use of reactive materials is most applicable to sediment and as such has been included for consideration within the sediment in-situ capping process option.

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MDEQ Specific Comment 36:

Section: 6, Page: 6-9, Paragraph/Table: 6.5.1

Dewatering: As long as mechanical dredging is being considered as the representative removal process option, the passive dewatering presented in this section is acceptable. However, it may be appropriate to consider hydraulic dredging along with dewatering options such as geotubes and filter presses as the FS progresses.

Response

This comment is acknowledged. The Area 1 ASTM and Area 1 FS are used to identify and evaluate representative technologies for each alternative; however, alternate technologies are not intended to be excluded and may be considered during the remedial design once the remedy has been selected.

MDEQ Specific Comment 37:

Section: 7, Page: 7-1

While MNR would be expected to be carried forward, there should be some assessment of the ability of MNR to achieve RAOs either as a standalone technology or in conjunction with other remedial technologies. This could lead to the identification of areas where enhanced MNR would help achieve RAOs.

Response

SED-2 relies solely on MNR (as evaluated through a long-term monitoring program). The effectiveness of this alternative has been evaluated in the Area 1 FS. SED-3 through SED-6 have been revised in the Area 1 ASTM (and Area 1 FS Report) to include MNR. This change has been made to the alternative names and descriptions.

MDEQ Specific Comment 38:

Section: 7, Page: 7-2

What data has been collected to help evaluate the effectiveness of removal associated with some of the alternatives? For example, alternative SED-3A includes removal of Hot Spot S-IMI-1. However, what information was used to determine that removal of Hot Spot S-IMI-1 was preferred over some other method? Absence of debris? Relative high concentration area in small volume? Capping is not implementable due to water depth or erosion issues?

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Response

Information generated through the TCRAs, along with information from other sites, was used where possible in the Area 1 FS Report to evaluate the effectiveness of removal alternatives. As described in Section 6 of the Area 1 ASTM, the use of capping as an alternative was based on consideration of many factors, such as water depth, potential for ice scour, velocities, and lack of navigational concerns. SIM-1 and the other hot spot areas were not considered to be suitable for capping; therefore, No Further Action, MNR, and removal were the only selected process options for these areas. Also, note that addressing the hot spots through removal would result in reduction of the Area-wide SWAC (though minimal) as well as removal of PCBs at depth that have the potential to become re-mobilized in the future. The Crown Vantage area was considered to be the most conducive to capping, based on the above considerations; therefore capping was retained for this area.

MDEQ Specific Comment 39:

Section: 7, Page: 7-2

SED-3A/B through SED-5A/B can be combined to one set (A/B) of alternatives; 'A' being the removal of all hot spots and capping of Crown Vantage and 'B' removal of all hot spots and Crown Vantage. There is no need to separate S-IM from the rest of the hot spots. Additionally, RD sampling should be proposed to identify those 'unidentified' hot spot areas and, therefore, it does not need to be a separate alternative.

Response

See the response to Specific Comment 8 regarding past discussions pertaining to the development of alternatives.

Removal of S-IM1 (along with removal/capping of Crown Vantage) was included as a standalone alternative as it has the highest current SWAC of all hot spot areas and is the only location with PCB concentrations greater than 50 mg/kg at the surface.

The Area 1 SRI Report and the Area 1 ASTM both acknowledge the potential need for additional assessment to identify additional hot spots, and this is also acknowledged in the Area 1 FS Report. Two sediment alternatives (SED-5A and SED-5B) have been developed to address potential unidentified hot spots.

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MDEQ Specific Comment 40:

Section: 7, Page: 7-2, Paragraph/Table: SED-6

There should be other alternatives similar to SED-6, with the range of RALs requested by the MDEQ.

Response

See the response to Specific Comment 8 regarding past discussions pertaining to the development of alternatives and the response to Specific Comment 2 regarding the volume/SWAC/mass evaluation for the additional RALs.

MDEQ Specific Comment 41:

Section: 7, Page: 7-3

Additional RALs for floodplains should be added as requested by the MDEQ.

Response

The Area 1 ASTM content and methods were developed through multiple discussions with the USEPA Region 5 Project Manager and MDEQ in order to provide the information that decision makers would need for risk management.

As stated in the Area 1 ASTM, an RAL of 20 mg/kg results in 98% of possible 1-acre home ranges having concentrations below the lowest recommended PRG of 11 mg/kg and 100% below the second PRG of 18 mg/kg within the former Plainwell Impoundment. Furthermore, current conditions in the former Plainwell Impoundment and the Plainwell No. 2 Dam Area combined are protective of approximately 87% of possible home ranges, which is above the 80% goal assumed to be protective of local populations. The justification for an RAL of 20 mg/kg is presented in the Area 1 ASTM and USEPA and MDEQ verbally concurred with this approach in those planning meetings. Figures 5-17 and 5-18 show the EPCs that would result from the implementation of each candidate RAL and Figure 5-19 demonstrates how the EPCs compare to the relevant risk-based concentrations (RBCs). For example, the implementation of an RAL of 20 mg/kg for the 1-acre moving window results in 100% of EPCs being below the LOAEL RBC and 98% being below the geometric mean of the NOAEL and LOAEL RBC.

It should also be noted that the environmental values to be protected (i.e., the assessment endpoints) are defined in the Area 1 TBERA as the sustainability of local populations. Thus, an RAL does not have to be protective of 100% of all possible individuals to sustain a local population and to be included for consideration.

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MDEQ Specific Comment 42:

Section: 7, Page: 7-5, Paragraph/Table: 7.1.2

Any long-term monitoring (LTM) program for MNR should include bathymetry and/or bank profile work to determine lateral and vertical movement (see page 7-5 for SED and 7-13 for floodplain). Consideration of bathymetric conditions should not be limited to just the Former Plainwell dam impoundment, but should be a consideration for the river as a whole to help better understand how the system responds over time.

Response

Evaluating changes in channel morphology over time "...for the river as a whole to help better understand how the system response over time..." is not an appropriate objective for MNR monitoring and does not relate to achievement of RAOs.

MDEQ Specific Comment 43:

Section: 7, Page: 7-13, Paragraph/Table: 7.2.2

Any LTM program for MNR should include bathymetry and/or bank profile work to determine lateral and vertical movement (see page 7-5 for SED and 7-13 for floodplain).

Response

It is assumed that bank monitoring and maintenance will continue in the former Plainwell Impoundment under the agreement with MDEQ until MDEQ and USEPA agree this is not needed. Concerning other areas of the river, see response to MDEQ comment #42.

MDEQ Specific Comment 44:

Section: 7, Page: 7-13, Paragraph/Table: 1

The description of periodic inundation of the floodplain soils should precisely define: (1) the period of flooding that is considered "short lived"; (2) the erosional/depositional nature of the forces associated with these events; (3) the likelihood of a complete exposure pathway from inundated soils to aquatic biota during flooded condition; and (4) a discussion of elevation by river mile (or plan view map) of areas inundated according to these criteria.

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Response

The level of evaluation proposed is inconsistent with the agreement to increase the aquatic sediment quantities by 5% in Area 1 so as to account for frequently inundated areas in close proximity to the river and to avoid the debate over the issues raised in this comment – which has long been a subject of technical disagreement with respect to how MDEQ would like to represent the linkage between floodplains and PCB uptake by fish.

To address the apparent concern over the sentence containing the phrase “short-lived” – the entire sentence was deleted from the Area 1 ASTM. The specific sentence removed is: “As described in the Area 1 SRI Report, while the natural floodplains of Area 1 continue to be periodically inundated, periods of flooding are relatively short lived.”

MDEQ Specific Comment 45:

Section: 4, Page: Table 4-1, Paragraph/Table: TSCA

Add requirements of 761.125(c)(4)(v): 10 inches minimum excavation and clean soil replacement and 761.130 as TBCs.

Response

40 CFR Part 761 as a whole (including all applicable subsections) is currently included on Table 4-1 of the Area 1 ASTM.

MDEQ Specific Comment 46:

Section: 4, Page: Table 4-1, Paragraph/Table: NREPA/Rule 57

The state Water Quality Standard (WQS) as approved by the USEPA should be cited (Rule 57). The approved state WQS is 0.00012 micrograms per liter (ug/L) for protection of wildlife and 0.000026 ug/L for protection of human health. These should be considered ARARs (relevant and appropriate) rather than a TBC. If this value is below background, then the USEPA should either use its background policy or pursue a technical impracticability waiver.

Response

The state WQS are currently included in the Area 1 ASTM Table 4-1 as an ARAR. Applicable water quality standards have been added to Table 4-1 as requested. A technical impracticability waiver will be necessary for these standards, and this is noted in the Area 1 FS Report.

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MDEQ Specific Comment 47:

Section: 4, Page: Table 4-1, Paragraph/Table: Trigger

A TBC for fish should include MDEQ's 10 parts per trillion trigger level for dioxin/furan and coplanar PCBs.

Response

Per MDEQ request, a TBC for fish based on MDEQ's 10 parts per trillion trigger level for dioxin/furan and coplanar PCBs has been incorporated into Table 4-1.

MDEQ Specific Comment 48:

Section: 4, Page: Table 4-3, Paragraph/Table: CWA

Section 401 of the Clean Water Act (CWA) regulates any federally authorized activity which may result in any discharge into navigable waters and requires reasonable assurance that the action will comply with applicable water quality standards. This should be identified as an action specific ARAR applicable to any activity that may result in a discharge to navigable waters.

Response

Section 401 of the CWA has been added as an ARAR to the revised Area 1 ASTM as requested.

MDEQ Specific Comment 49:

Section: 6, Paragraph/Table: Table 6-1

Table 6-1 includes a footnote regarding riverbank soils that states: "The Remedial Technology Screening Memo also included GRAs for bank soils, but stated they were relevant only if there were unstable/eroding river banks with PCBs at concentrations above relevant risk-based cleanup levels." The footnote should clarify that the risk-based cleanup levels are based on in-water risks to human health and the environment.

Response

The intent of the referenced footnote is to provide information as to why there is not a separate set of screening tables particular to bank soils and clarifies that the general response actions pertaining to bank soils is addressed within Item G of the Floodplain Soils component of Table 6-1.

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MDEQ Specific Comment 50:

Section: 6, Paragraph/Table: Table 6-2

General: The screening presented in Table 6-2 relies on information from other sites in some instances. While this is acceptable as a starting point, the evaluation should also include site specific information that may be relevant, even from a screening perspective. For example, the MNR effectiveness evaluation relies on Lake Hartwell as an example without presentation of any lines of evidence to support MNR. Site specific information must be provided to demonstrate the effectiveness of MNR either as a standalone technology or in conjunction with active remediation of hot spots or other high concentration sediment areas. Just because a technology is effective and/or implementable at one site is no guarantee it will be effective/implementable at the Kalamazoo River site.

Response

The revised Area 1 ASTM incorporates additional Area-specific information (when available) in Table 6-2 as requested (e.g., MNR). It should be noted that, as documented in the Section 6 tables, site-specific experience gleaned from the two TCRAs conducted previously in Area 1 has been relied upon significantly in the selection of representative process options. The Area 1 FS Report continues to consider applicable Area-specific information within the alternatives evaluation.

MDEQ Specific Comment 51:

Section: 6, Paragraph/Table: Table 6-2

Rechannelization: Under implementability, the table states that this technology is implementable in areas where property is available. How much property is realistically available to allow this technology to be implementable? The permits and stakeholder involvement necessary for rechannelization may make this technology unimplementable.

Response

Agreed. Table 6-2 screens potential process options based on effectiveness, implementability, and cost. On the basis of this evaluation, rechannelization was determined not to be readily implementable within Area 1 due to limiting Area-specific characteristics and administrative concerns, along with effectiveness and cost considerations. Therefore, rechannelization was not selected as a representative process option in the Area 1 ASTM and was not considered in the Area 1 FS Report.

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MDEQ Specific Comment 52:

Section: 6, Paragraph/Table: Table 6-3

Erosion Control: Under the effectiveness evaluation (implementation effects) for vegetative cover, it should be noted that vegetative erosion control could result in habitat improvements if designed and implemented properly.

Response

Text has been added to Table 6-3 to indicate that vegetative erosion control could be designed to incorporate habitat improvements.

MDEQ Specific Comment 53:

Section: 6, Paragraph/Table: Table 6-4

Ex-situ Treatment: The cost of stabilization/solidification should be rated higher than that of particle separation; the costs of particle separation may be offset through beneficial reuse of larger particle fractions as fill material.

Response

As documented in the approved *Multi-Area Preliminary Remedial Technology Screening Memorandum* (ARCADIS 2010), beneficial reuse was not retained as a process option due to lack of demonstrated cost-effective uses. In light of this, and in consideration of USEPA Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (USEPA 1988) that indicates the cost of each process option should be evaluated relative to those of the same technology type, the costs for stabilization/solidification and particle separation will remain rated as "medium" cost.



Attachment 1

Review of RAOs for
Sediment Sites

Review of RAOs for Sediment Sites

Area 1 FS Planning Meeting
July 23, 2012
Romulus, MI

RAO Precedents for Sediment Sites

Site Name	Lead Agency	RAO Narratives
Ashtabula River Ashtabula, OH	USEPA/ OEPA (GLLA Project)	<ul style="list-style-type: none"> To restore all beneficial uses to the Area of Concern, prohibit the discharge of toxic substances in toxic amounts, and virtually eliminate the discharge of persistent toxic substances (overall remedial goal stated in the Comprehensive Management Plan)
Buffalo River, NY	USEPA/ Riverkeeper (GLLA Project)	<ul style="list-style-type: none"> Reduce human exposures for direct sediment contact and fish consumption from the Buffalo River by reducing the availability and/or concentration of COCs in sediments Reduce the exposure of wildlife populations and the aquatic community to sediment COC concentrations that are above protective levels Reduce or otherwise address legacy sediment COC concentrations to improve the likelihood that future dredged sediments (for routine navigational, commercial, and recreational purposes) will not require confined disposal Implement a remedy that is compatible with the Buffalo River Remedial Advisory Committee's goal of protecting and restoring habitat and supporting wildlife
Coeur d'Alene Basin	USEPA (ROD)	<ul style="list-style-type: none"> Reduce human exposure to soil, sediments, and source materials, including residential yard soil, that have concentrations of contaminants of concern (COCs) greater than selected risk-based levels for soil Remediate soil, sediments, and surface water to mitigate mining-related impacts and provide habitat capable of supporting a functional ecosystem for the aquatic and terrestrial plant and animal population in the Upper Basin Maintain (or provide) soil and sediment quality capable of supporting a functional ecosystem for waterfowl and riparian songbirds in the Upper Basin Maintain (or provide) soil, sediment, and surface water quality supportive of aquatic biota that are protected under the Endangered Species Act, the Fish and Wildlife Conservation Act, and the Migratory Bird Treaty Act Prevent ingestion or uptake of and dermal (skin) contact with arsenic, cadmium, copper, lead, mercury, silver, and zinc by ecological receptors at concentrations that result in unacceptable risk Prevent transport and deposition of arsenic, cadmium, copper, lead, mercury, silver, and zinc from soil and sediments into surface water and groundwater at concentrations above applicable or relevant and appropriate requirements (ARARs)

RAO Precedents for Sediment Sites

Site Name	Lead Agency	RAO Narratives
Commencement Bay Nearshore/ Tideflats Tacoma, WA	USEPA (ROD, ESD)	<ul style="list-style-type: none"> Restore and preserve aquatic habitats by limiting and/ or preventing the exposure of environmental receptors to sediments with contaminants above Washington State Sediment Management Standards
GE Housatonic River (Upper Reach), Pittsfield, MA	USEPA (Action Memo)	<ul style="list-style-type: none"> Mitigate the human health and environmental threat posed by the existing high levels of PCBs in river sediments, and bank and floodplain soils Eliminate or mitigate existing sources of contamination to the Upper Reach of the Housatonic River; to prevent the recontamination of previously remediated floodplain properties and further contamination of other floodplains Prevent the downstream migration of contaminated sediments and bank soils
GE Housatonic River (Rest of River), Pittsfield, MA	USEPA	<ul style="list-style-type: none"> Reduce the cancer risk and non-cancer health hazard for humans (defined as achieving concentrations that do not pose unacceptable risks using EPA's cancer risk range of 1×10^{-6} to 1×10^{-4} and a non-cancer Hazard Index [HI] of 1) from exposure to PCBs in dietary items, floodplain soil, and/or sediment in the Rest of River Reduce the risks to ecological receptors from exposure to PCBs in dietary items, floodplain soil, and/or sediment in the Rest of River to levels that will result in the recovery and maintenance of healthy local populations and communities of biota Eliminate/minimize the long-term downstream transport of PCBs in the Rest of River. The objective of this RAO is to reduce the transport of PCBs from the highly contaminated upper reaches of the River to downstream reaches as quickly as possible and over the long term. This RAO also includes the control of sources of releases to the River
General Motors Central Foundry Division, Massena, NY	USEPA (ROD)	<ul style="list-style-type: none"> Remedial action objectives are not specifically provided. EPA states: "Hot spots in the St. Lawrence and Raquette rivers and Turtle creek will be dredged and excavated to remove PCBs. All PCB contaminated sediments in the hot spots will be removed given the technological limitations associated with dredging"

RAO Precedents for Sediment Sites

Site Name	Lead Agency	RAO Narratives
Gowanus Canal	USEPA (ROD)	<ul style="list-style-type: none"> • Reduce to acceptable levels toxicity to benthic organisms in the canal from direct contact with polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and metals in sediment • Reduce to acceptable levels the risk to herbivorous birds from dietary exposure to PAHs • Reduce to acceptable levels the risk to human health from the incidental ingestion of and dermal contact with PAHs in sediment and surface water during recreational use of the canal or from exposure to canal overflow • Reduce the risk to human health from ingestion of PCB-contaminated fish and shellfish collected from the canal • Prevent the migration of non-aqueous-phase liquid (NAPL) into the canal after the remedial action is completed • Prevent NAPL from serving as a source of contaminants to groundwater discharging to the canal
Hudson River Superfund Site, NY	USEPA (ROD)	<ul style="list-style-type: none"> • Reduce the cancer risks and non- cancer health hazards for people eating fish from the Hudson River by reducing the concentration of PCBs in fish • Reduce the risks to ecological receptors by reducing the concentration of PCBs in fish • Reduce PCB levels in sediments in order to reduce PCB concentrations in river (surface) water that are above surface water ARARs • Reduce the inventory (mass) of PCBs in sediments that are or may be bioavailable • Minimize the long-term downstream transport of PCBs in the river
Kinnickinnic River Milwaukee, WI	WDNR/ USEPA (GLLA Project)	<ul style="list-style-type: none"> • Reduce the risks of PCB and PAH contaminated sediments to aquatic life and human health • Reduce the transport of PCBs and PAHs from the Kinnickinnic River downstream to the Milwaukee Harbor and Lake Michigan • Improve water quality in the Kinnickinnic River and Milwaukee Estuary AOC • Improve biota, fish, and wildlife habitat in the Kinnickinnic River • Expedite the process of eliminating the fish consumption advisory in the Kinnickinnic River • Improve recreational and commercial navigation conditions for economical development in the area • Improve aesthetics of the stream • Reduce non-point source pollution

RAO Precedents for Sediment Sites

Site Name	Lead Agency	RAO Narratives
Little Mississinewa River Superfund Site Union City, IN	USEPA (ROD)	<ul style="list-style-type: none"> • Protect humans from exposure to PCBs at levels that could pose a health risk in residential flood plain areas • Protect humans who consume fish from exposure to PCBs that exceed protective levels; • Protect ecological receptors from PCBs in the river channel and recreational flood plain areas that exceed protective levels • Protect the LMR and its flood plains from recontamination from PCBs at depth in river sediments and flood plain areas during and after the implementation of the remedy • Remove the encumbrances on local residents resulting from long-term contamination of their properties with PCBs • Achieve, to the extent practicable, surface water quality criteria throughout the LMR
Lower Fox River Superfund Site, WI	USEPA (ROD)	<ul style="list-style-type: none"> • Achieve, to the extent practicable, surface water quality criteria throughout the Lower Fox River and Green Bay • Protect humans who consume fish from exposure to Contaminants of Concern (COCs) that exceed protective levels • Protect ecological receptors from exposure to COCs above protective levels • Reduce transport of PCBs from the Lower Fox River into Green Bay and Lake Michigan • Minimize the downstream movement of PCBs during implementation of the remedy

RAO Precedents for Sediment Sites

Site Name	Lead Agency	RAO Narratives
Naval Station – McAllister Point Landfill Newport, RI	USEPA (ROD)	<ul style="list-style-type: none"> • Prevent human ingestion of shellfish impacted by sediments with COC concentrations exceeding cleanup levels • Prevent exposure of aquatic organisms to sediments with COC concentrations exceeding cleanup levels • Prevent avian-predator ingestion of shellfish impacted by sediments with COC concentrations exceeding cleanup levels • Minimize migration of sediments with COC concentrations exceeding selected PRGs to offshore areas and previously unaffected areas of Narragansett Bay • Prevent washout of landfill debris into marine environment
Onondaga Lake Superfund Site Syracuse, NY	NYSDEC (ROD)	<ul style="list-style-type: none"> • Eliminate or reduce, to the extent practicable, methylation of mercury in the hypolimnion • Eliminate or reduce, to the extent practicable, releases of contaminants from the ILWD and other littoral areas around the lake • Eliminate or reduce, to the extent practicable, releases of mercury from profundal sediments • Be protective of fish and wildlife by eliminating or reducing, to the extent practicable, existing and potential future adverse ecological effects on fish and wildlife resources and to be protective of human health by eliminating or reducing, to the extent practicable, potential risks to humans • Achieve surface water quality standards, to the extent practicable, associated with CPOIs

RAO Precedents for Sediment Sites

Site Name	Lead Agency	RAO Narratives
Outboard Marine Corp. (Waukegan Harbor) Waukegan, IL	USEPA (ROD)	<ul style="list-style-type: none"> Long-term, isolate or reduce the concentrations of PCBs in harbor sediment so that PCB concentrations in resident, harbor-caught fish will decline and ideally meet protective levels Short-term, steps should be taken (maintain fish-consumption advisories) to prevent the over-consumption of PCB-impacted fish until protective levels are reached
Portland Harbor	USEPA (ROD)	<ul style="list-style-type: none"> Reduce to acceptable levels human health risks from exposure to contaminated sediments resulting from incidental ingestion of and dermal contact with sediments, and comply with identified ARARs Reduce to acceptable levels the risks to ecological receptors resulting from the ingestion of and direct contact with contaminated sediments and comply with identified ARARs
Sheboygan River and Harbor Superfund Site Sheboygan, WI	USEPA (ROD)	<ul style="list-style-type: none"> Protect human health and the environment from imminent and substantial endangerment due to PCBs attributed to the Site Mitigate potential PCB sources to the Sheboygan River/Harbor system and reduce PCB transport within the river system Remove and dispose of Confined Treatment Facility (CTF) / Sediment Management Facility (SMF) sediments and previously armored/capped PCB-contaminated soft sediment deposits
Shiawassee River Superfund Site, MI	USEPA (ROD)	<ul style="list-style-type: none"> Protect human health and the environment from imminent and substantial endangerment due to PCBs attributed to the Site

Fish Consumption RAO Precedents – Further Description

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Site Name	Lead Agency	Fish Consumption Related RAO Narratives
Hudson River Superfund Site, NY	USEPA	<ul style="list-style-type: none"> • Reduce the cancer risks and non- cancer health hazards for people eating fish from the Hudson River by reducing the concentration of PCBs in fish. The risk-based PRG for the protection of human health is 0.05 mg/kg PCBs in fish fillet based on non- cancer hazard indices for the RME adult fish consumption rate of one half-pound meal per week (this level is protective of cancer risks as well). Other target concentrations are 0.2 mg/kg PCBs in fish fillet, which is protective at a fish consumption rate of one half pound meal per month and 0.4 mg/kg PCBs in fish fillet, which is protective of the CT or average angler, who consumes one half-pound meal every two months. Attaining such levels might facilitate the relaxation of the fish consumption advisories and fishing restrictions (e.g., the “eat none” advisory for the Upper Hudson could be relaxed as conditions improve) • Reduce the risks to ecological receptors by reducing the concentration of PCBs in fish. The risk-based PRG for the ecological exposure pathway is a range from 0.3 to 0.03 mg/kg PCBs in fish (largemouth bass, whole body), based on the LOAEL and the NOAEL for consumption of fish by the river otter. The ecological PRG is considered protective of all the ecological receptors evaluated because it was developed for the river otter, the piscivorous mammal calculated to be at greatest risk from PCBs at the Site. In addition, a range from 0.7 to 0.07 mg/kg PCBs in spottail shiner (whole fish) was developed based on the NOAEL and LOAEL for the mink, which is a species known to be sensitive to PCBs. Other species, such as the bald eagle, were considered but are at less risk than the river otter

Fish Consumption RAO Precedents – Further Description

Site Name	Lead Agency	Fish Consumption Related RAO Narratives
GE Housatonic River (Rest of River), Pittsfield, MA	USEPA	<ul style="list-style-type: none"> The Revised Corrective Measures Study Report lists Interim Media Protection Goals (IMPGs) for PCBs in the edible tissues of fish and waterfowl based on human consumption of fish and waterfowl. Specific IMPGs were calculated for bass fillets, trout fillets, and duck breast tissue, using both a deterministic approach (based on the assumptions and parameters used in EPA's deterministic Fish and Waterfowl Consumption Risk Assessment) and also a probabilistic approach (based on the one-dimensional Monte Carlo model that EPA used in the HHRA). For each type of edible tissue, IMPGs were derived for cancer risks based on combined adult and childhood exposure, and non-cancer IMPGs were separately derived for adults and children. To be consistent with the HHRA methodology, the IMPG values developed for bass consumption are applicable to consumption of largemouth bass, brown bullhead, sunfish, and perch, while the IMPG values for trout consumption are applicable only to the consumption of trout.
Lower Fox River Superfund Site, WI	USEPA (ROD)	<ul style="list-style-type: none"> Protect humans who consume fish from exposure to COCs that exceed protective levels. This RAO is intended to protect human health by targeting removal of fish consumption advisories as quickly as possible. The WDNR and USEPA defined the expectation for the protection of human health as recreational and high intake fish consumers being able to safely eat unlimited amounts of fish within 10 years to 30 years, respectively Protect ecological receptors from exposure to COCs above protective levels. This RAO is intended to protect ecological receptors such as invertebrates, birds, fish, and mammals. WDNR and USEPA defined the ecological expectation of achieving safe ecological thresholds for fish-eating birds and mammals within 30 years following remedy completion. Although the FS did not identify a specific time frame for evaluating ecological protection, the 30-year figure was used as a measurement tool

Fish Consumption RAO Precedents – Further Description

Site Name	Lead Agency	Fish Consumption Related RAO Narratives
Outboard Marine Corp. (Waukegan Harbor) Waukegan, IL	USEPA (ROD)	<ul style="list-style-type: none"> Over the short term, steps should be taken (maintain fish-consumption advisories) to prevent the over-consumption of PCB-impacted fish until protective levels are reached. This means that once the Agency completes the cleanup action, and after PCB levels in resident, harbor-caught fish begin to fall, adults and most children who consume these fish under the exposure assumptions given above would be exposed to PCBs at levels that would not cause their estimated ELCRs to exceed 1 in 10,000 or their calculated HI quotients to exceed 1. People consuming frequent visitor fish (such as carp) will be expected to have reduced health risks but perhaps not to the same extent as for resident fish
Sheboygan River and Harbor Superfund Site Sheboygan, WI	USEPA (ROD)	<ul style="list-style-type: none"> Protect human health and the environment from imminent and substantial endangerment due to PCBs attributed to the Site. To achieve this remediation objective, PCB-contaminated soft sediment will be removed so that the entire river will reach an average PCB sediment concentration of 0.5 mg/kg or less over time. An average PCB sediment concentration of 0.5 mg/kg results in an excess human health carcinogenic risk of 1.0×10^{-4}, or less over time, through the consumption of PCB-contaminated fish. Based on site specific biota to sediment accumulation factors, the corresponding PCB tissue levels for resident fish are: <ul style="list-style-type: none"> Sport Fish: Small Mouth Bass: 0.31 mg/kg, Walleye: 0.63 mg/kg, Trout: 0.09 mg/kg Bottom Feeders: Carp: 2.58 mg/kg, Catfish: 2.53 mg/kg Achievement of the soft sediment concentration and fish tissue concentrations, over time, will be reevaluated every five years after completion of the remedy. Reaching the river sediment objective of a 0.5 mg/kg average PCB concentration requires different approaches for the Upper, Middle, and Lower River, and the Inner Harbor because of the way sediment is distributed and whether the contaminated sediment is considered mobile given the dynamics of that specific river component